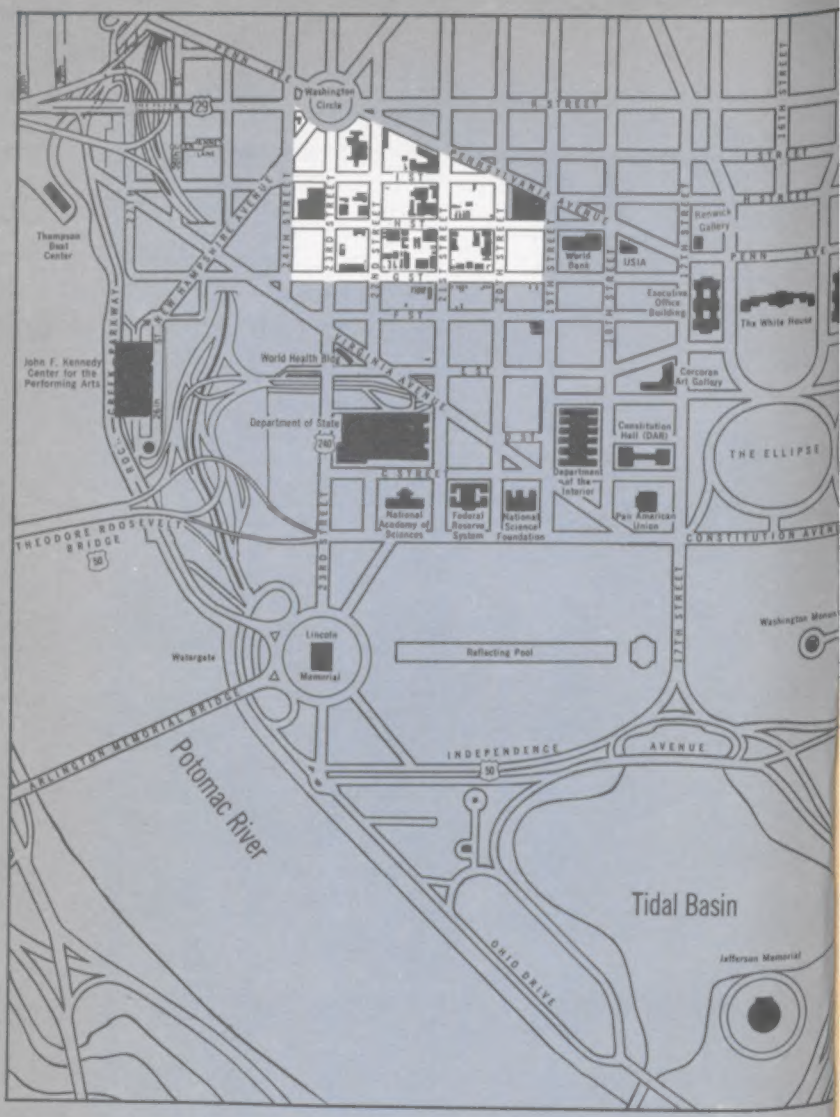


GEORGE WASHINGTON UNIVERSITY BULLETIN
ne LXXVIII, Number 3, May 1979

ERGRADUATE AND GRADUATE PROGRAMS
-1980



THE GEORGE WASHINGTON UNIVERSITY CAMPUS/WASHINGTON, D. C.

THE GEORGE WASHINGTON UNIVERSITY BULLETIN

(USPS 343-070)

Volume LXXVIII, Number 3, May 1979

Published by The University at Washington, D. C. 20052

SIX TIMES PER YEAR: MARCH, APRIL, MAY, JULY, AUGUST, AND DECEMBER

Second Class Postage Paid at Washington, D. C.

HE GEORGE WASHINGTON UNIVERSITY BULLETIN

NDERGRADUATE AND
RADUATE PROGRAMS 1979-1980

RTS AND SCIENCES, EDUCATION AND HUMAN DEVELOPMENT,
OVERNMENT AND BUSINESS ADMINISTRATION,
UBLIC AND INTERNATIONAL AFFAIRS

his Bulletin lists the programs and faculties of Columbian College of s and Sciences, the Graduate School of Arts and Sciences, the School Education and Human Development, the School of Government and iness Administration, the School of Public and International Affairs, the Division of University Students.

or information concerning the School of Engineering and Applied nce, the National Law Center, the School of Medicine and Health nces, the College of General Studies, or the Summer Sessions, please uest the appropriate bulletin.

UNIVERSITIES are undergoing change, either drastically slowly, as they have been for centuries. Whatever the changes, one premise on which universities are based remains consta universities are for learning—for acquiring learning, for transmitt learning, and for the exploration that yields new learning. Any ot objective is unworthy of a university, and any other purpose incompatible with the best interests of students and their relati ship to the institution.

The faculty, through scholarship and research, extends learn and it transmits learning by teaching. Students learn from faculty, the library, and the laboratory—if they accept, as they m learning as their objective. This learning does not take place i vacuum; in addition to the particular content of learning, stude will develop certain habits of mind—analytical thinking, power insight, self-examination, and the use of rational discourse—will serve them throughout their personal and professional lives.

Within this basic context, George Washington University inv students to take up their residence in order that their energies terests, and talents may be directed to learning.

Exceptional opportunities for learning are made possible bec of the University's location in the heart of the nation's capital. example, cooperative programs are conducted in various fields study with members of Congress, the Smithsonian Institution, Library of Congress, the National Gallery of Art, and other fed and private organizations. In addition to these programs, Washin presents opportunities for observation, study, service, and rec tion limited only by students' time, energy, and imagination.

In this atmosphere, George Washington University seeks to vide a matrix for learning not available in the standard univer education, so that graduates can never forget that as students were at the center of government and that they must forever additional responsibility in and for society, because of the op tunity that was theirs.

The George Washington Univer
LLOYD H. ELLIOTT
President

ONTENTS

ıge

5 The University Calendar
9 The University
9 History
0 Purpose and Objectives
0 The Colleges, Schools, and Divisions
2 Academic Status
3 University Policy on Equal Opportunity
3 Location
3 The University Libraries
4 The Board of Trustees of the University
6 Officers of Administration
8 Committees of the University
9 The Faculty Senate
0 Admission
7 Registration
8 Fees and Financial Regulations
3 Financial Aid
9 Prizes
4 Regulations
2 Associations and Services
2 Consortium of Universities of the Washington Metropolitan Area, Inc.
3 The Speech and Hearing Clinic
3 The Reading Center
4 Veterans Benefits
4 ROTC
1 Center for Academic and Administrative Computing
5 Continuing Education for Women
5 General Alumni Association
5 English for International Students
Student Life
Columbian College of Arts and Sciences
Graduate School of Arts and Sciences
School of Education and Human Development
School of Government and Business Administration
School of Public and International Affairs
Division of University Students
Division of Experimental Programs
The Summer Sessions
Policy Studies and Special Projects
Sponsored Research
Courses of Instruction
Accounting
American Studies Program
Anatomy
Anthropology
Art
Art Therapy—Graduate Program
Biochemistry—Graduate Programs
Biological Sciences
Business Administration

Page

253 Chemistry
259 Classics
262 Early Modern European Studies
263 East Asian Languages and Literatures
266 Economics
275 Education
292 Education Policy—Doctoral Program
293 English
302 Environmental Studies
304 Experimental Humanities
305 Forensic Sciences—Graduate Programs
309 General Curriculum in the Liberal Arts
310 Genetics—Graduate Programs
313 Geography and Regional Science
317 Geology
323 Germanic Languages and Literatures
327 Health Care Administration
333 History
346 Human Kinetics and Leisure Studies
355 Institute for Sino-Soviet Studies
356 International Relations—Doctoral Program
357 Journalism
360 Judaic Studies
360 Latin American Studies
361 Literature—Interdepartmental Graduate Studies
362 Management Science
369 Mathematics
378 Microbiology—Graduate Programs
381 Museum Studies—Graduate Program
383 Music
388 New Courses in General and Interdisciplinary Studies
389 Pathology—Graduate Programs
391 Pharmacology—Graduate Programs
394 Philosophy
397 Physics
403 Physiology—Graduate Programs
406 Political Science
418 Psychology
427 Public Administration—Graduate Programs
432 Public and International Affairs
432 Religion
438 Romance Languages and Literatures
448 Service-Learning Program
449 Slavic Languages and Literatures
454 Sociology
461 Special Education
466 Speech and Drama
477 Statistics
485 Urban and Regional Planning—Graduate Program
488 Women's Studies—Graduate Program
491 Faculty and Staff of Instruction
542 Index

HE CALENDAR 1979-1980*

1979 1980

AUGUST

S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

SEPTEMBER

S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30						

OCTOBER

S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

NOVEMBER

S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	

DECEMBER

S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

JANUARY

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

FEBRUARY

S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	

MARCH

S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

APRIL

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30			

MAY

S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

JUNE

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30					

JULY

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

1979 FALL SEMESTER

August 27	Orientation begins for students from foreign countries and for freshmen who did not attend Summer Advance Registration Program
August 28	Placement tests and advising for entering freshmen who did not attend Summer Advance Registration Program
	Orientation begins for transfer students
August 29	Placement tests and advising for transfer students
	Advising for sophomores, juniors, and seniors in the School of Government and Business Administration
† August 30-September 1	Registration; application for February graduation due as part of registration
September 3	Labor Day (holiday)
September 4	On-campus classes begin
September 5	University Faculty Assembly meeting

Academic Calendar is subject to change.
registration procedure and the hours of registration will be stated in the *Schedule of*
es, which is available well in advance of each semester.

September 13	Off-campus classes begin
September 14	Applications due for October Ed.D. Comprehensive Exam nations
	Faculty Senate meeting
October 10	Applications due for November Master's Comprehensiv Examinations in the School of Public and Internation Affairs and in the School of Government and Busine Administration
October 12	Faculty Senate meeting
October 13	Ed.D. Comprehensive Examinations
October 18	Board of Trustees meeting
November 1	Applications due for spring semester financial aid
November 9	Applications due for Ed.D., Ed.S., and M.A. in Ed. Co prehensive Examinations
	Faculty Senate meeting
November 9-10	School of Public and International Affairs and School Government and Business Administration Master's Co prehensive Examinations
November 19	D.B.A., D.P.A., and Ph.D. dissertations due from Febru candidates
November 21	Thanksgiving holiday begins after last class
November 26	Classes resume
December 4	Last day of fall semester on-campus classes
December 8	Ed.D., Ed.S., and M.A. in Ed. Comprehensive Examinati
December 10-19	Examination period
December 14	Faculty Senate meeting
December 21	Last day of fall semester off-campus classes

1980	**SPRING SEMESTER**
January 3	Master's theses and Ed.D. dissertations due from Febru candidates
January 7	Orientation for students from foreign countries
January 8-9	Orientation for new students; advising for all student
January 9	All degree requirements to be completed and reporte the Graduate School of Arts and Sciences for Febru graduation
* January 10-12	Registration; application for May graduation due as of registration
January 11	Applications due for February Ed.D. Comprehensive Ex nations
January 14	Spring semester on-campus and off-campus classes b
January 17	Board of Trustees meeting
January 18	Faculty Senate meeting
January 22	University Faculty Assembly meeting
February 1	Deadline for submission of 1980-81 freshmen student fi cial aid applications
February 8	Faculty Senate meeting
February 18	Winter Convocation (holiday)

* The registration procedure and the hours of registration will be stated in the Schedu Classes, which is available well in advance of each semester.

February 23	Ed.D. Comprehensive Examinations
March 1	Deadline for submission of 1980-81 undergraduate continuing and transfer student financial aid applications
	Ph.D. dissertations due from May candidates
March 5	Applications due for April Master's Comprehensive Examinations in the School of Public and International Affairs and the School of Government and Business Administration
March 7	Faculty Senate meeting
March 8	Spring recess begins after last class
March 14	Applications due for Ed.D., Ed.S., and M.A. in Ed. Comprehensive Examinations
	Board of Trustees meeting
March 17	Classes resume
	Ed.D. dissertations due from May candidates
March 24	D.B.A. and D.P.A. dissertations due from May candidates
April 1	Deadline for submission of Summer Sessions and 1980-81 graduate financial aid applications
April 11	Faculty Senate meeting
April 11-12	School of Government and Business Administration and School of Public and International Affairs Master's Comprehensive Examinations
April 14	Master's theses due from all May candidates except those in the School of Public and International Affairs
April 17	All degree requirements to be completed and reported to the Graduate School of Arts and Sciences for May graduation
April 18	Master's theses due from May candidates in the School of Public and International Affairs
	Last day of spring semester on-campus classes
April 19	Ed.D., Ed.S., and M.A. in Ed. Comprehensive Examinations
April 21-May 3	Examination period
April 28	Last day of spring semester off-campus classes
May 1	Last day for current master's degree candidates in the Graduate School of Arts and Sciences to apply for Ph.D. programs
May 2	Faculty Senate meeting
May 4	Commencement
May 15	Board of Trustees meeting

FACTS ABOUT GEORGE WASHINGTON UNIVERSIT

General Information	Private, nonsectarian, coeducation founded 1821
Location	Washington, D.C., bounded by Pennsylvania Avenue and 19th, F, and 24th Streets, N.W.
Number of On-campus Students	8,537 full-time; 8,263 part-time (equivalent to 12,386 full-time students altogether)
Geographical Origin of Students	50 states, District of Columbia, 120 countries
1979-80 Tuition	Undergraduate: $3,200 for two semesters; graduate: $117 for each semester hour (see page 28)
Number of Full-time Faculty	1,019 (81% with doctoral degrees)
Number of Part-time Faculty	493 (includes some of the most distinguished men and women in Washington)
Residence Hall Space	2,072
Room and Board	Cost varies from approximately $1 to $2,320 for the academic year (see page 59)

Undergraduate majors: Accounting, American Civilization, American Litera Anthropology, Applied Mathematics, Applied Statistics, Art History, Biol Botany, Business Administration, Cartography, Chemistry, Chinese Lan and Literature, Civil Engineering, Classical Archeology and Anthrop Classical Archeology and Classics, Classical Humanities, Computer Sc Dramatic Art, Early Modern European Studies, East Asian Studies (Chin Japan), Economics, Electrical Engineering, Elementary Education, English L tute, Environmental Studies, Fine Arts, French Language and Litera Geodesy, Geography, Geology, Germanic Languages and Literatures, His Human Kinetics and Leisure Studies, International Affairs, Journalism, Ju Studies, Latin American Studies, Mathematical Statistics, Mathematics, chanical Engineering, Medical Technology, Middle Eastern Studies, M School Education, Music, Nursing Anesthesia, Nurse Practitioner Pro Oceanography, Philosophy, Physician's Assistant Program, Physics, Po Science, Premedicine, Psychology, Public Affairs, Radiologic Sciences and ministration, Religion, Russian Language and Literature, Russian Literature Culture—in Translation, Secondary Education, Sociology, Spanish Amer Literature, Spanish Language and Literature, Speech Communication and Br casting, Speech Pathology and Audiology, Urban Affairs, Zoology

Study leading to graduate or professional degrees is offered in the Grad School of Arts and Sciences, the National Law Center, the School of Me and Health Sciences, the School of Engineering and Applied Science, the Sc of Education and Human Development, the School of Government and Busi Administration and the School of Public and International Affairs.



THE UNIVERSITY

HISTORY

The George Washington University had its beginning in 1821 as The Columbian College in the District of Columbia. The name of the institution was changed in 1873 to Columbian University and in 1904 to The George Washington University. The debt of the University to George Washington, whose name it bears, is an intangible one.

George Washington, as President and as private citizen, had urgently insisted upon the establishment of a national university in the federal city. There he hoped that, while being instructed in the arts and sciences, students from all parts of the country would acquire the habits of good citizenship, throwing off local prejudices and gaining at first hand a knowledge of the practice, as well as the theory, of republican government. To further the materialization of his hopes, Washington left a bequest of fifty shares of The Potomac Company, "towards the endowment of a University to be established within the limits of the District of Columbia, under the auspices of the General Government, if that government should incline to extend a fostering hand towards it." The Congress never extended a "fostering hand." The Potomac Company passed out of existence, and Washington's bequest became worthless.

Fully conscious of Washington's hopes, but motivated primarily by a great missionary urge and the need for a learned clergy, a group of dedicated ministers and laymen sponsored a movement for the establishment of a college in the District of Columbia. Inspired largely by the zeal and energy of the Reverend Luther Rice, they raised funds for the purchase of a site and petitioned Congress for a charter. After much delay and amendment, Congress granted a charter which was approved by President Monroe on February 9, 1821. To safeguard the College's nonsectarian character it provided "That persons of every religious denomination shall be capable of being elected Trustees, nor shall any person, either as President, Professor, Tutor or pupil, be refused admittance into said College, or denied any of the privileges, immunities, or advantages thereof, for or on account of his sentiments in matters of religion."

During the entire time when the institution was known as Columbian College, its activities were centered on College Hill, a tract of forty-six and a half acres between the present Fourteenth and Fifteenth Streets extending north from Florida Avenue to somewhat beyond Columbia Road. The Medical School was located downtown. For the better part of the Columbian University period the buildings of the University were situated facing H Street between Thirteenth and Fifteenth Streets.

During the last half-century the University's present plant has been developed in that section of the old First Ward familiarly known as "Foggy Bottom," between Nineteenth and Twenty-fourth Streets, south of Pennsylvania Avenue. The area has many memories of historic interest to the University. President Monroe, who signed the Charter, lived at 2017 Eye Street. The first President of the Board of Trustees, the Reverend Obadiah

B. Brown, was for fifty years the pastor of a church at Nineteenth and Eye Streets, and Washington selected Twenty-third and E Streets as the site of the National University he hoped to see established.

PURPOSE AND OBJECTIVES

The purpose of The George Washington University was to realize "the aspirations of Washington, Jefferson and Madison for the erection of a university at the seat of the Federal Government." Over the years it has been the aim to develop the University ideal in the nation's capital with a view toward meeting the changing needs of society while continuing to pursue the traditional principles of learning and research.

The George Washington University now rededicates itself and all the resources at its command to the pursuit of knowledge and its dissemination.

To this end:

The University recognizes its special opportunities in and obligations to one of the principal capitals of the world. It is a primary objective of the University to utilize its historical, geographical, and functional relationship to the nation's capital and the Washington community in continuing the development of a great nationally and internationally oriented university.

The University recognizes the needs of our times and accepts the challenge to develop each student's potential abilities to the fullest extent.

The University is and should remain privately controlled, nonsectarian and coeducational.

Admission to the University is determined only in terms of the personal character and academic qualifications of the candidates.

A broadly based liberal education is fundamental to the total program of the University.

Expansion of graduate and professional studies and research and the utilization for this purpose of the excellent research facilities and materials available in the nation's capital are basic to the continuous development of the University's educational program.

The provision of superior instruction and facilities and the application of high standards of entrance qualifications and academic achievement for all students whether full-time or part-time, on-campus or off-campus, are major missions of the University.

A balanced program of student extracurricular activities is an integral part of the University program.

The University will continue to strive to meet the evident needs of an enlarged student body while governing the size of enrollment by its capacity to supply adequate staff and facilities for the excellent teaching and research which it espouses.

THE COLLEGES, SCHOOLS, AND DIVISIONS

George Washington University includes 12 colleges, schools and divisions as follows:

Columbian College of Arts and Sciences offers four-year programs in the arts and sciences leading to the degrees of Bachelor of Arts and Bachelor of Science. The College also provides pre-legal and pre-medical programs, and the pre-professional work required for admission to the School of Public and International Affairs. Columbian College has academic jurisdiction over the off-campus programs leading to the degrees of Associate in Arts in General Studies, Bachelor of General Studies, Bachelor of Science in Geodesy, Bachelor of Science in Cartographic Science and Bachelor of Science in Oceanography. These off-campus programs are administered by the College of General Studies.

The Graduate School of Arts and Sciences offers advanced study and research leading to the degrees of Master of Arts, Masters of Arts in Special Studies, Master of Fine Arts, Master of Forensic Sciences, Master of Music, Master of Science, Master of Science in Forensic Science, Master of Science in Special Studies, Master of Science for Teachers and Doctor of Philosophy. The degrees of Master of Arts in Special Studies and Master of Science in Special Studies are also available through off-campus programs administered by the College of General Studies.

The School of Medicine and Health Sciences offers work leading to the degrees of Associate in Science, Bachelor of Science, and Doctor of Medicine.

The National Law Center offers courses leading to the degrees of Juris Doctor, Master of Laws, Master of Comparative Law, Master of Comparative Law (American Practice), and Doctor of Juridical Science; and special programs in Continuing Legal Education.

The School of Engineering and Applied Science offers courses leading to the degree of Bachelor of Science in the following areas: civil engineering, electrical engineering, and mechanical engineering. Graduate programs lead to the degrees of Master of Science, Master of Engineering Administration, Engineer, Applied Scientist, and Doctor of Science. The School has academic jurisdiction over the off-campus programs leading to the degrees of Master of Science, Master of Engineering Administration, and Doctor of Science. These off-campus programs are administered by the College of General Studies.

The School of Education and Human Development offers undergraduate programs leading to the degrees of Bachelor of Arts in Education and Bachelor of Science in Human Kinetics and Leisure Studies; graduate studies leading to the degrees of Master of Arts in Education, Master of Arts in Teaching, Education Specialist, and Doctor of Education. The degree of Master of Arts in Education is also available through off-campus programs administered by the College of General Studies.

The School of Government and Business Administration offers under-

graduate programs leading to the degrees of Bachelor of Business Administration and Bachelor of Science in Health Care Administration; graduate programs leading to the degrees of Master of Accounting, Master of Arts in Health Care Administration, Master of Business Administration, Master of Public Administration, Master of Urban and Regional Planning; the Post-master's Graduate Certificate in Health Care Administration; the degrees of Doctor of Business Administration and Doctor of Public Administration.

*The School of Public and International Affairs** offers undergraduate programs leading to the degree of Bachelor of Arts and graduate programs leading to the degree of Master of Arts. The School also offers an off-campus program leading to the degree of Master of Science in International Affairs.

The College of General Studies supplements the adult education program of the University through campus and off-campus study; conferences, seminars, and special projects; and continuing education and non-credit programs. This College also administers the off-campus program over which Columbian College of Arts and Sciences, the Graduate School of Arts and Sciences, the School of Engineering and Applied Science, the School of Education, and the School of Government and Business Administration have academic jurisdiction.

The Division of University Students makes available courses for students not candidates for degrees in this University.

The Division of Experimental Programs supports University-wide curricular experimentation and development, especially the development of new courses and new programs that entail interdisciplinary or inter-school cooperation or that utilize educational resources in the Washington community.

The Summer Sessions.

ACADEMIC STATUS

George Washington University is accredited by its regional accrediting agency, the Middle States Association of Colleges and Secondary Schools.

The University is on the approved list of the American Association of University Women and is a member of the College Entrance Examination Board.

The National Law Center is a charter member of the Association of American Law Schools and is approved by the Section of Legal Education and Admissions to the Bar of the American Bar Association. The School of Medicine and Health Sciences is a member of the Association of American Medical Colleges and is one of the medical colleges which have been continuously approved by the American Medical Association. Undergraduate curricula of the School of Engineering and Applied Science in civil, electrical, and mechanical engineering are accredited by the Engineers' Council for Professional Development. The School of Education and Human Development is a charter member of the American Association of Colleges for Teacher Education and is accredited by the National

* The National Law Center cooperates with the School of Public and International Affairs, the Graduate School of Arts and Sciences, and the School of Government and Business Administration in offering a program leading to the combined degrees of Juris Doctor and Master of A-

Council for Accreditation of Teacher Education for its bachelor's and master's degree programs. The School of Government and Business Administration has maintained full membership in the Middle Atlantic Association of Colleges of Business Administration since 1961. It joined the Council on Graduate Education for Public Administration in 1966. In 1968, the School became a member of the American Assembly of Collegiate Schools of Business and, in 1977, its undergraduate program was accredited by the Assembly. The programs in accounting satisfy the educational requirements for the Certified Public Accountant and the Certified Management Accountant professional examinations. The program in hospital administration is accredited by the National Accrediting Commission on Graduate Education for Hospital Administration. The Master of Urban and Regional Planning degree program is recognized by the American Institute of Planners. The Department of Chemistry is on the approved list of the American Chemical Society. The graduate program in clinical psychology in the Department of Psychology is on the approved list of the American Psychological Association. The program in speech pathology and audiology is accredited by the Education and Training Board of the American Boards of Examiners in Speech Pathology and Audiology.

UNIVERSITY POLICY ON EQUAL OPPORTUNITY

George Washington University does not discriminate against any person on the basis of sex, race, color, religion, national origin, or handicap in any of its education or employment programs or activities. Federal regulations implementing Title IX of the Education Amendments of 1972 and the Rehabilitation Act of 1973 call for an explicit statement that the requirement not to discriminate on the basis of sex or handicap extends to employment in and admission to such programs and activities. The University is also subject to the District of Columbia Human Rights Law.

Inquiries concerning the application of this policy and federal laws and regulations concerning discrimination in education or employment programs and activities may be addressed to Marianne Phelps, Assistant Provost for Affirmative Action, Rice Hall, Washington, D.C. 20052, or to the Director of the Office for Civil Rights of the Department of Health, Education, and Welfare.

LOCATION

The University is in downtown Washington, between Pennsylvania Avenue and 19th, F, and 24th Streets, N.W. Immediately adjacent areas are the White House, the World Bank, the Corcoran Gallery of Art, the Department of State, the National Academy of Sciences, the John F. Kennedy Center for the Performing Arts, and many other governmental and cultural institutions.

THE UNIVERSITY LIBRARIES

The library collections of the University are housed in the University Library (the general library of the University) and in the libraries of the Institute for Sino-Soviet Studies, the National Law Center, and the School of Medicine and Health Sciences.

These collections contain approximately 787,000 volumes, to which are added some 40,000 volumes a year. Endowments supplementing the University appropriation provide books in the fields of American civilization, American literature, foreign service, history, public finance, and the social sciences; and gifts from many sources have enriched the collections. The libraries currently receive about 8,000 serials.

Information concerning the use of the libraries may be obtained at the library service desks.

The library is administered for the curricular, reference, and recreational needs and interests of the students. Instruction in the use of the library is given upon request by the reference librarians. The library endeavors to assist students and all members of the University to use the rich library resources of Washington and the unusual opportunities they offer for extensive research. Interlibrary loan arrangements are maintained with other libraries in the city and throughout the United States.

The student has access to the Library of Congress, the Public Library of the District of Columbia and its branches, and many of the special collections of the government departments. Graduate students at George Washington University may, upon application, be issued a Consortium library card which permits direct borrowing from the libraries of the other Consortium Institutions.

THE BOARD OF TRUSTEES OF THE UNIVERSITY

The University is privately endowed and is governed by a Board of Trustees of which the President of the University is an *ex officio* member.

E.K. Morris, LL.D., D.P.S., *Chairman Emeritus*
Charles E. Phillips, LL.B., LL.M., *Chairman Emeritus*

Glen A. Wilkinson, B.S., J.D., *Chairman*
Everett H. Bellows, M.A., *Vice Chairman*
James M. Mitchell, M.A., *Secretary*
Thaddeus A. Lindner, B.A. in Govt., *Assistant Secretary*

George M. Bunker, B.S.
Mortimer M. Caplin, B.S., LL.B., J.S.D., LL.D.
*Lyn Henderson Clark, B.A.
Henry C. Clausen, J.D.
Jacqueline Cochran, L.H.D., LL.D., Sc.D.
Donald C. Cook, B.A., M.B.A., J.D., LL.M., L.H.D., LL.D.
L. Stanley Crane, B.S.
*Joseph B. Danzansky, B.A., J.D.
Nancy B. Dudley, B.A. in Govt.

* Alumni trustee.

John B. Duncan, B.A., LL.B., LL.D.
Morton I. Funger, B.A.
Katharine Graham, B.A.
Edwin K. Hoffman, B.S.
Joseph D. Hughes, B.S., J.D., LL.M., LL.D.
L.A. Jennings
David M. Kennedy, LL.B., M.A., LL.D.
Melvin R. Laird, B.A., L.H.D., LL.D., D.Pol.S.
*Sidney A. Levine, B.A., M.D.
Franklin J. Lunding, LL.B., LL.D.
Jeremiah Milbank, B.A., M.B.A.
Thornton W. Owen, B.S. in C.E., B.A.
Flaxie M. Pinkett, B.A.
*Abe Pollin, B.A. in Govt.
S. Dillon Ripley II, Ph.D., L.H.D., Sc.D.
Orville F. Rush, J.D., LL.D.
John T. Sapienza, B.A., LL.B.
Carleton D. Smith
Douglas R. Smith, B.S.C.
Robert H. Smith, B.A.
Carleton M. Stewart, M.B.A.
Mark Sullivan, Jr., B.A.
John W. Thompson, Jr., B.A.
Robert L. Tull, B.A.
William G. White, B.S. in C.E.
Stephen R. Woodzell, B.S. in E.E.
James O. Wright, B.S., J.D.
*Joseph S. Wright, LL.B., LL.D.

Honorary Trustees

Jacob Burns, LL.B., LL.D.
George A. Butler, LL.B.
Leon Chatelain, Jr.
Harry F. Duncan
Newell W. Ellison, B.A., LL.B., LL.D.
Melville B. Grosvenor, B.S., Sc.D., LL.D.
Brooks Hays, B.A., J.D., LL.D., L.H.D., D.C.L., D.D., H.H.D.
Joseph H. Hirshhorn
E.K. Morris, LL.D., D.P.S.
Godfrey L. Munter, B.A., LL.B., LL.D.
Charles E. Phillips, LL.B., LL.M.
Charles E. Smith
Alexander Wetmore, Ph.D., Sc.D.
John J. Wilson, LL.B., LL.D.
Watson W. Wise, Ph.B., Litt.D.

OFFICERS OF ADMINISTRATION*

The University

Lloyd Hartman Elliott, M.A., Ed.D., LL.D., *President*
Phillip Donald Grub, D.B.A., *Special Assistant to the President for International Programs*
Harold Frederick Bright, Ph.D., *Provost and Vice President for Academic Affairs*
Marianne Ruth Phelps, B.A., M.S., M.A., M.Phil., *Assistant Provost for Affirmative Action*
Margaret Persse Trexler, B.A., *Assistant Provost for Faculty Personnel and Academic Publications*
Seymour Alpert, B.A., M.D., *Vice President for Development*
Charles Edward Diehl, B.Arch.Engr., B.C.E., M.B.A., *Vice President and Treasurer*
Maurice Kingsley Heartfield, Jr., B.A., *Assistant Vice President and Assistant Treasurer*
Robert Emmett Dickman, M.B.A., *Assistant Treasurer*
Margaret Payne Greene, B.S., *Assistant Treasurer, Sponsored Programs*
John Collum Einbinder, B.A. in Govt., *Director of Business Affairs*
William David Johnson, B.S., *Director of Planning and Budgeting*
Ronald Paul Kaufman, B.S., M.D., *Vice President for Medical Affairs*
Carl James Lange, Ph.D., *Vice President for Administration and Research*
Louis Harkey Mayo, B.S., J.S.D., *Vice President for Policy Studies and Special Projects*
Frederick Justin Naramore, B.S., C.P.A., *Comptroller*
Neal Barnett Berryman, B.B.A., C.P.A., *Assistant Comptroller*
William Parkhurst Smith, Jr., B.A., M.B.A., M.A. in Ed., *Vice President for Student Affairs*

Boris Constant Beil, M.S. in P.E., *Director of the Lloyd Heck Marvin Center*
Mary Capen, M.D., *Director of the Student Health Service*
James Eugene Clifford, B.S., *Director of Personnel Services*
Robert Faris, B.S., *Director of Intercollegiate Athletics for Men; Director of the Smith Center*
Robert Gebhardtsbauer, B.A., M.A., *Registrar*
Lyndale Harpster George, M.A. in Ed., *Director of Intercollegiate Athletics for Women*
Gail Short Hanson, B.A., M.A., *Dean of Students*
Robert Gean Jones, B.D., Ph.D., *University Marshal*
Elmer Louis Kayser, Ph.D., LL.D., L.H.D., *University Historian*
Jon Clarke Keates, M.A., *Director of Alumni Relations*
Frances S. Marsh, B.S., *Acting Director of Public Relations*
Patricia Jahn McMillen, M.A. in Ed., *Advisor to International Students*
Joseph Young Ruth, B.A., *Director of Admissions*
Rupert Woodward, B.S., B.S. in L.S., M.A., *University Librarian*

---

* The President of the University, the Vice President for Academic Affairs, the Registrar, the Director of Admissions of the University, and the University Librarian are officers of all divisions of the colleges and schools of the University.

The Colleges, Schools, and Divisions

Calvin Darlington Linton, Ph.D., *Dean of Columbian College of Arts and Sciences*

Henry Solomon, Ph.D., *Dean of the Graduate School of Arts and Sciences*

Philip Stanley Birnbaum, M.S. in M.E., E.C.E., *Dean for Administrative Affairs of the Medical Center*

Dennis Sophian O'Leary, B.A., M.D., *Dean for Clinical Affairs of the Medical Center*

Lawrence Thompson Bowles, B.A., M.S., M.D., Ph.D., *Dean for Academic Affairs of the Medical Center*

Robert Kramer, B.A., LL.B., *Dean of the National Law Center*

Harold Liebowitz, D.Sc.E., *Dean of the School of Engineering and Applied Science*

Robert Edward Baker, M.A., Ed.D., *Acting Dean of the School of Education and Human Development*

Norma Maine Loeser, D.B.A., *Dean of the School of Government and Business Administration*

Burton Malcolm Sapin, Ph.D., *Dean of the School of Public and International Affairs*

John Gage Allee, Jr., Ph.D., *Dean of the Division of University Students*

Robert Lee Holland, Ph.D., *Dean of the College of General Studies*

William Francis Edward Long, Ph.D., *Dean of the Summer Sessions*

Roderick Stuart French, Ph.D., *Director of the Division of Experimental Programs*

Fred Leonard, Ph.D., *Associate Dean for Research of the Medical Center*

Robert Kemmowitz, B.A., M.S., M.D., *Associate Dean for Student Affairs and Admissions, Medical Center*

Winfield Harker Scott, Ph.D., *Associate Dean for Education and Director of Education of the Medical Center*

Robert James Van Houten, M.D., *Associate Dean of the Medical Center for Graduate and Continuing Medical Education*

W. Wallace Kirkpatrick, B.A., LL.B., *Associate Dean of the National Law Center*

Edward Andrew Potts, B.A., LL.B., *Associate Dean of the National Law Center for Graduate Studies, Research, and Projects*

James Elmer Fear, Ph.D., *Associate Dean of the School of Engineering and Applied Science*

Leon Gintzig, Ph.D., *Associate Dean of the School of Government and Business Administration*

Alvin Carl Jensen, Ed.D., *Associate Dean of the College of General Studies*

Barbara Joan Dunham, M.A., *Assistant Dean of Columbian College of Arts and Sciences*

Robert Earle Knowlton, Ph.D., *Assistant Dean of Columbian College of Arts and Sciences*

Joseph Louis Metivier, Jr., M.A., *Assistant Dean of Columbian College of Arts and Sciences*

Robert Clinton Rutledge, Ph.D., *Assistant Dean of Columbian College of Arts and Sciences*

Avery Delano Andrews, Ph.D., *Assistant Dean of the Graduate School of Arts and Sciences*

Edward Alan Caress, Ph.D., *Assistant Dean of the Graduate School of Arts and Sciences*
Charles Edward Rice, Ph.D., *Assistant Dean of the Graduate School of Arts and Sciences*
David Alton Rowley, Ph.D., *Assistant Dean of the Graduate School of Arts and Sciences*
Perry Botwin, M.A., Ed.D., *Acting Assistant Dean of the School of Education and Human Development*
David Francis Bergwall, M.B.A., D.B.A., *Assistant Dean of the School of Government and Business Administration*
John Lobuts, Jr., B.S., Ed.D., *Assistant Dean of the School of Government and Business Administration*
Bjorn Karsten Netland, M.A., *Assistant Dean of the Division of University Students*
Ruth H. Osborn, Ed.D., *Assistant Dean of the College of General Studies for Continuing Education for Women*
Billie Jo Moreland, B.A., M.A., Ed.D., *Assistant Dean of the College of General Studies*
James Noel, B.A., M.A., Ed.D., *Assistant Dean of the College of General Studies*
Salvatore Rocco Paratore, B.A., M.S., Ph.D., *Assistant Dean of the Summer Sessions*

COMMITTEES OF THE UNIVERSITY 1978-79

Committee on the Judicial System: G.J. Ginsberg *(Chairman)*, M.G. Gallagher, L.P. Ribuffo, three student members

Student-Faculty Committee on Appeals: R.C. Nash *(Chairman)*, J.C. Hodgsheimer, N.K. Khatcheressian, J.F. McCarthy, four student members

Committee on Religious Life: R.C. Jones *(Chairman)*, J.G. Boswell, E. Caress, J.A. Greenberg, R.E. Kennedy, Jr., five student members

Committee on Student Publications: A.E. Claeyssens, Jr. *(Chairman)*, L. Bodian, C. McCormick, J. Murphy *(ex officio)*, F.J. Naranjo *(ex officio)*, P. Robbins, W.E. Schmidt, D. Wallace, Jr., six student members

Committee on the University Bookstore: R.F. Dyer *(Chairman)*, F.N. Albert, M.S. Harwitz *(ex officio)*, J.K. Kern, R. Munt *(ex officio)*, three student members

Committee on Federal Educational Allowances: H. Solomon *(Chairman)*, H.F. Bright, L.H. Elliott *(ex officio)*, W.D. Johnson *(ex officio)*, C.D. Lee

Committee on Research: H. Solomon *(Chairman)*, H.F. Bright, A.B. Carroll, J. Lieberman, D.R.K. Hennes, C.J. Lange, F. Leonard, M.N. Raslan, T. Toridis, D.G. White

Committee on Sponsored Research: M. Frederiksen *(student member)*

hairman), A.C. Hollinshead, C.I. Lange *(ex officio)*, F. Leonard *(ex officio)*, I. Levy, A.W. Reitze, G.W. Smith, T.G. Toridis, G.A. Walker, six student embers

ommittee on Research on Humans: J.W. Hillis *(Chairman)*, I.H. Cisin, C.J. ange, B.I. Levy, A.S. Parrish, M.N. Rashid, T.G. Toridis

ommittee on Animal Facilities: E. Albert *(Chairman)*, J. Bailey, E. Bradley, . Geelhoed, R. Hitzelberg *(ex officio)*, M. Jackson, C.J. Lange *(ex officio)*, . Leonard *(ex officio)*, P. Moskovitz, R. Packer, M. Reich, A. Sarna, R.D. Valk, B. Zook *(ex officio)*

ommittee on University Parking: J.C. Einhinder *(Chairman)*, C.E. Diehl *(ex ficio)*, J.W. Fleck, R.R. Fox, J. Hawkins, J. Meilo *(ex officio)*, R. Munt *(ex officio)*, M. Phelps, four student members

HE FACULTY SENATE 1979-80

Frederick Amling
Robert Edward Baker
Philip Stanley Birnbaum
Harold Frederick Bright
James Philip Chandler
Stephen Reed Chitwood
Astere Evarist Claeyssens, Jr.
Victor Hugo Cohn, Jr.
Lloyd Hartman Elliott
Raymond Richard Fox
Michael Graham Gallagher
Robert Gebhardtsbauer
Gilbert Jerome Ginsburg
Marvin Gordon
William Byron Griffith
Janet Craig Heddesheimer
Peter Proal Hill
Robert Gean Jones
Robert Kramer
*Harold Liebowitz
Donald Linkowski
*Calvin Darlington Linton
*Norma Maine Loeser
Robert Eugene Park
Howard Clemeth Pierpont
John Palmer Reesing, Jr.
David Reiss
Lilien Filipovitch Robinson
*Burton Malcolm Sapin
Stefan Otto Schiff
Jay Robert Shotel
*Henry Solomon
Henry Malcolm Steiner
Theodore George Toridis
Glenn Anthony Walker
†Reuben Esselstyn Wood
John Edmund Ziolkowski

O'Neal Smalls, *Parliamentarian*

---

*Ex officio member
†Chairman of the Executive Committee

ADMISSION

The University accepts both men and women. Students are admitted at the beginning of each semester and summer session.

An application for admission to degree candidacy should be accompanied by a $15 (for undergraduate study) or $25 (for graduate study) application fee.* The application fee is waived for graduates of this University applying to the Graduate School of Arts and Sciences and for students applying for readmission who were registered as degree candidates at the time of their last registration at this University and who have not since registered at another institution.

Applicants are urged to submit the application form and complete credentials well in advance of the semester for which they seek admission. Specific dates are given in each section below.

Acceptance is based on space available and a prediction of potential for successful study. The following criteria are considered: degree or major objective related to type of program and grades achieved in secondary school or college, standardized test scores, relationship between grades and test scores, and recommendations.

The right is reserved to refuse admission to any student with an academic record which creates doubt of ability to succeed in college or who, for any other reason, would not be an acceptable student. In the selection process, there is no discrimination because of sex, race, color, religion, handicap, or national origin.

UNDERGRADUATE ADMISSION†

Forms for application for admission or readmission to undergraduate or nondegree status are available at and should be returned to the Office of Admissions, George Washington University, Washington, D.C. 20052.

Secondary School Students

Applicants who wish to begin college in the fall semester or in a summer session should apply during the fall term of the senior year in high school. Preference will be given to students who submit applications and required credentials prior to March 1. Students graduating at mid-year who wish to begin college in the spring semester should apply no later than November 1.

Although decisions on most applications for the fall semester will require submission of seventh-term grades and senior year test scores, earlier decision will be given after September 1 to students whose applications become complete with secondary school records through the sixth

* Application fee must be by check or postal money order, payable to George Washington University.

† For detailed admission requirements, see the appropriate college or school in this Bulletin. Tests required for admission are described on pages 73-74 and 136. See pages 25-26 for admission requirements for students from foreign institutions.

ear and junior-year test scores, provided these records clearly establish dmissibility.

Early Admission Plan—Unusually well-prepared students who have ompleted the junior year in high school may be considered for admission. This plan is designed for those students who, in terms of academic reparation and emotional maturity, are ready to enter college. More ften than not, students interested in early admission have substantially xhausted the high school offerings in several academic areas. For such tudents, remaining in high school for the senior year would not be in neir best interest, nor in the best interest of the school.

To be considered for early admission, students must:

1. meet most of the secondary school requirements for graduation and omplete the University's required entrance units (see page 67),
2. have the unqualified recommendation of the secondary school princial or counselor,
3. submit two letters of recommendation (in addition to the counselor's) rom teachers who can testify to the student's maturity and general readiess to enter college,
4. submit SAT or ACT scores.

The student's chances for admission will be improved if scores of CEEB chievement tests or Advanced Placement Tests in subjects taken in the ophomore year are submitted.

Applicants from a secondary school must arrange to have sent directly rom their schools to the Office of Admissions a complete academic record ogether with a personal evaluation and recommendation from the principal. This information should be supplied on a standard form used by the econdary school.

ransfer Students

Undergraduate transfer students from other institutions should submit application and required credentials prior to June 1 for the fall semester, November 1 for the spring semester, and April 1 for the summer sessions. The transfer student must be in good standing as to scholarship and conduct. A student who has been academically dismissed or suspended more than one time normally will not be considered for admission.

An applicant who has attended one or more institutions of higher learning must request each registrar to mail directly to the Office of Admissions transcript of his or her record even though credits were not earned.

If high school units are not shown on the college transcript, the applicant must request that the high school record be sent to the Office of Admissions.

If an applicant has fewer than 30 semester units of acceptable work (6 r better in academic courses from an accredited institution at the time he application is submitted, the applicant must request that his or her igh school record and College Entrance Examination Board or ACT test cores be sent to the Office of Admissions.

dvanced Tuition Deposit

fter notification of acceptance, a $100 advanced tuition deposit will be quired of all full-time undergraduate students including those readmitted

This deposit is not due until May 1 for students entering in the fall se
mester or until December 15 for students entering in the spring semeste
The deposit is credited toward tuition and is not refundable.

Advanced Standing and Advanced Placement

CREDIT FROM INSTITUTIONS OF HIGHER LEARNING

Where there is no duplication involved either through course work
examination, credit may be granted for work successfully completed
accredited institutions of higher learning. Although transfer credit may
assigned, it must meet requirements for the degree sought in order to
counted towards that degree. Credit may be accepted provisionally. Wo
of low-pass grade (D or the equivalent) will not be considered for transfe

Except for students transferring to the School of Government and Bus
ness Administration from a two-year or junior college, in which case
more than 60 semester hours of credit may be assigned, there is no stri
limit to the total amount of credit that may be assigned. However,
student must satisfy the residence and course requirements for the degr
sought at George Washington University.

CREDIT BY EXAMINATION

Assuming there is no duplication of course work, a maximum of
semester hours of credit may be assigned upon admission to the Univers
for each or any combination of the following except as noted:

COLLEGE ENTRANCE EXAMINATION BOARD ADVANCED PLACEMENT TESTS (APT)

Credit is assigned for examinations passed with scores of four or five
the basis of a score report sent to the Office of Admissions from the E
cational Testing Service at the student's request. Examinations passed w
scores of three will be considered for credit or placement if the stud
arranges to have the examination paper sent to the Office of Admissi
The Advanced Placement Tests are administered in the second
school in May of each year. Normally only students who complet
course designated as Advanced Placement are prepared for the exam
tion. Arrangements for the examination are the responsibility of the
plicant and should be made through the secondary school attended
with the Program Director, College Entrance Examination Board,
vanced Placement Tests, Box 592, Princeton, N.J. 08540, or Box 1
Berkeley, Calif. 94701.

COLLEGE ENTRANCE EXAMINATION BOARD COLLEGE-LEVEL EXAMINATION PROGRAM (CLEP)

CLEP offers two types of examinations: General and Subject Exam
tions. CLEP General Examinations are offered in five areas: mathema
social sciences, humanities, natural sciences, and English compos
CLEP Subject Examinations measure achievement in specific college-
courses and are offered in more than 20 subjects.

Upon admission to a program leading toward a degree, credit is assigned for the General Examinations, with the exception of the English composition examination and the mathematics examination.* To receive credit, examinations must be passed at the 50th percentile or above (1963/1972 college sophomore norms). Credit is assigned, with a few exceptions, for the Subject Examinations passed at the level recommended in the College Board model policy.* A candidate for a degree from any school at this University must seek departmental and dean's approval *prior* to taking the examination to receive credit for a CLEP Subject Examination. Credit may not be earned by passing the examination after having taken the equivalent course. Arrangements for the examinations are the responsibility of the applicant and should be made with the College Entrance Examination Board College-Level Examination Program, Box 1824, Princeton, N.J. 08540.

SPECIAL DEPARTMENTAL EXAMINATIONS FOR UNDERGRADUATES

Except for students admitted to the School of Government and Business Administration, credit may be assigned for Special Departmental Examinations, see page 75.

CREDIT EARNED THROUGH UNITED STATES ARMED FORCES INSTITUTE (USAFI)

Except for students enrolled in the School of Government and Business Administration, credit is assigned for approved United States Armed Forces Institute college-level examinations passed with satisfactory scores.

CREDIT FROM SERVICE SCHOOLS

Except for undergraduates admitted to the School of Education and Human Development or the School of Government and Business Administration, a limited amount of credit may be assigned for selected service school instruction received since 1941. No more than 30 semester hours may be assigned for a combination of service schools and examinations referred to above. Veterans should submit to the Office of Admissions photostatic copies of their service school records, indicating courses successfully completed with sufficient identification of the course to locate it in the *Guide to Evaluation of Educational Experience in the Armed Forces.*

ADVANCED PLACEMENT

Advanced placement or waiver of a requirement will be granted on the basis of scores on Achievement Tests of the College Entrance Examination Board as follows:

---

* See pages 13–40 for additional qualifications for applicants to the School of Government and Business Administration.

Achievement Test	Minimum Score	Exemption
English Composition	650	Waives Engl 10
English Composition	680	Waives Engl 11 or 12
European and/or American History	600	Waives Hist 39-40 and/or 71-72
French	650	Waives a two-year language requirement
German	600	
Hebrew	600	
Latin	600	
Russian	700	
Spanish	650	

GRADUATE ADMISSION*

Graduate School of Arts and Sciences—Forms for application for admission or readmission are available at the Office of the Dean of the Graduate School of Arts and Sciences, George Washington University, Washington, D.C. 20052. Completed applications and requests for fellowship support must be submitted by February 15 [February 1 for students in clinical psychology and art therapy] for admission in the fall semester and by November 1 for the spring semester. Applications for graduate study are acceptable after these dates for admission in the corresponding semester and will be reviewed if time permits and if space is available in the program desired.

School of Education and Human Development—Forms for application for admission or readmission are available at the Office of the Dean of the School of Education and Human Development, George Washington University, Washington, D.C. 20052. When completed, these application forms should be submitted to this Office no later than June 1 for the fall semester, November 1 for the spring semester and April 1 for the summer sessions unless an extension is granted by the office of the dean.

School of Government and Business Administration—Forms for application for admission or readmission are available at the Graduate Admissions Office, School of Government and Business Administration, George Washington University, Washington, D.C. 20052. For admission in the fall semester, applications and supporting credentials should be submitted by April 1 for the Master of Arts in Health Care Administration and the Master of Urban and Regional Planning programs† and by May 1 for the other SGBA masters degree programs. Applications for all masters degree programs are due by November 1 for the spring semester, and by April 1 for the summer sessions. Applications are due from those applying for doctoral candidacy by March 1 for the summer sessions and the fall semester, and by October 1 for the spring semester. Applicants who received their undergraduate degrees from foreign universities must submit applications one month earlier in each case.

School of Public and International Affairs—Forms for application for admission or readmission are available at the Graduate Admissions Office, School of Public and International Affairs, George Washington University,

* For detailed admission requirements, see the appropriate college or school in this Bulletin. See pages 25-26 for admission requirements for students from foreign institutions.

† Admission to the Master of Urban and Regional Planning program is for the fall semester only.

Washington, D.C. 20052. When completed, these application forms should be submitted to this Office no later than March 1 (February 1 for applicants for graduate fellowships or assistantships and foreign applicants). Admission is for the fall semester only. All credentials, including transcripts from all institutions attended, Graduate Record Examination scores and letters of reference, must be received before the deadline date.

DIVISION OF UNIVERSITY STUDENTS ADMISSION

Forms for application for admission to nondegree status in the Division of University Students are available at and should be returned to the Office of Admissions, George Washington University, Washington, D.C. 20052. When completed these application forms with credentials where required, should be received by the Office of Admissions no later than the Friday before the 21st day of registration (see Calendar, pages 5-7). To avoid paying a late registration fee, every effort should be made to insure that any required credential is in the Office of Admissions prior to registration. No fee is charged for application for admission to this Division. For detailed entrance requirements, see pages 180-81.

Registration in a given course may be denied students in this Division when space is needed for degree candidates.

READMISSION

Students previously registered in the University who were not registered on campus during the immediately preceding semester (summer session excluded), must apply for readmission. Final dates for applying are the same as those for "Undergraduate Admission" (see page 23-24), or "Graduate Admission" (see pages 24-25). Students who apply as degree candidates and who were previously registered as nondegree students, or who attended one or more institutions of higher learning during absence from the University, must have complete official transcripts sent to the appropriate office at this University from each institution attended. Applications for readmission are considered on the basis of regulations in effect at the time of readmission.

The application fee is waived for students applying for readmission who were registered as degree candidates at the time of last registration at this University and who have not since registered at another institution.

STUDENTS FROM FOREIGN INSTITUTIONS*

Application, required records, and scores on the Test of English as a Foreign Language (see page 26) should be received from international students no later than March 1 (February 1 for applicants for graduate study in the School of Public and International Affairs) for the fall semester and October 1 for the spring semester.

* For detailed admission requirements, see the appropriate college or school in this *Bulletin*.

George Washington University offers an English-language program for foreign students.

Required Records

At the time the application is sent, students must request the educational institution previously attended to send directly to the appropriate admissions office (see "Undergraduate Admission," pages 20-21, or "Graduate Admission," pages 24-25), copies of official certificates and records listing subjects studied, grades received, examinations taken and degrees received. Certified copies of diplomas and certificates from all secondary schools, colleges, and universities attended are required. Records of state examinations and certificates are also required. These records become the property of the University and cannot be returned.

These documents should be in the language in which the institution keeps its official records. If they are in a language other than English the copies which are sent should be accompanied by an English translation.

Language Tests

Students whose native tongue is not English should take the *Test of English as a Foreign Language* (TOEFL) and have the scores submitted to the appropriate admissions office. Those students seeking admission to the School of Government and Business Administration must submit a TOEFL score. Students are responsible for making arrangements for taking the test by addressing inquiries to TOEFL, Educational Testing Service, Princeton, N.J. 08540, U.S.A., well in advance of the beginning of the semester for which admission is sought. The test fee remitted with the application entitles the student to have the test score sent to three different institutions. Registration for the *Test of English as a Foreign Language* does not constitute application for admission to George Washington University.

The *Bulletin of Information*, obtainable without charge, contains a description of the test as well as rules regarding application, fees, reports, and the conduct of the test; lists of examination centers; examination dates; and an application blank. On the application for the test, the student should specify that the scores be sent to the appropriate admissions office at this University (see "Undergraduate Admission," pages 20-21, or "Graduate Admission," pages 24-25).

In addition to the TOEFL, an admitted student is required to take a test in English as a second language prior to registration. Results of this test will determine the courses the student will be permitted to register for in the program of study. If the knowledge of English is inadequate to enable the student to undertake any academic work, the student will not be permitted to register for any courses other than English and will be required to study English on a full-time basis.

Financial Certificate

If a student plans to enter or remain in the United States to study at the University and the visa status will be either student (F) or exchange visitor (J), a Form I-20 or DSP-66 cannot be issued until the student has been admitted to the University and has completed the Financial Certificate to our satisfaction.



TRANSFER WITHIN THE UNIVERSITY

For information concerning transfer from one college, school, or division to another within the University, see page 47.

REGISTRATION

The dates, hours, and place of registration will be stated in the *Schedule of Classes*, which is available well in advance of each semester.

Registration in on-campus courses is open only to those persons formally admitted to the University by the appropriate admitting office, as well as those students in good standing who are continuing in an approved program of study.

No registration is accepted for less than a semester or one summer session.

Students may not register concurrently in this University and another institution without the prior permission of the dean of the college, school, or division in which registered in this University. Registration in more than one college, school, or division of the University requires the written permission of the deans concerned, prior to registration. Allowance of credit for work done concurrently at another institution is at the discretion of the appropriate committee.

Eligibility for Registration

Registration for the following categories of campus students is held on the days of registration stated in the University Calendar. A student who is suspended or whose record is not clear for any reason is not eligible to register. Registration in a given course may be denied students in the Division of University Students when space is needed for degree candidates.

New Student—Upon receipt of a letter of admission, the new student is eligible for registration on the stated days of registration.

Readmitted Student—A student previously registered in the University who was not registered for campus courses during the preceding semester or summer session must apply for and receive a letter of readmission from the appropriate admitting office before he or she is eligible for registration.

Continuing Student—The student registered for campus courses in the immediately preceding semester or the summer session preceding the fall semester is eligible to register assuming good standing and enrollment in a continuing program.

Registration Changes and Withdrawals (See pages 46-47)

Registration for Consortium Courses

Degree students interested in taking courses at any of the other in stitutions in the Consortium of Universities of the Washington Metropolita Area, Inc. (see pages 53-53), should consult the program announcements o the other institutions. Consortium application forms and instructions may be picked up in the Office of the Registrar after obtaining registratio materials. In order to participate in the Consortium program, students mus obtain the approval of an advisor and should ascertain from the depart ment of the institution where the course is taught whether they are eligibl for the course and whether there is space in the class. Specific inquiri should be addressed to the Registrar.

FEES AND FINANCIAL REGULATIONS

Fees paid by students cover only a portion of the cost of the operatio of the University. Income from endowment funds, grants, and gifts fro alumni and friends of the institution make up the difference.

The following fees and financial regulations were adopted for the 19 summer sessions and the academic year 1979-80. (See page 30 for pr jected tuition increases for 1980-83.)

Tuition Fees

For undergraduate study in Columbian College of Arts and Sciences, the Schoo of Education and Human Development, the School of Government and Business Administration, the School of Public and International Affairs, and for courses taken on campus by undergraduate students in the College of General Studies:

Full-time program (12 or more semester hours), each semester	$1,080
Part-time program, for each semester hour	117
Summer Sessions, for each semester hour	110

For graduate study* in the Graduate School of Arts and Sciences, the School of Education and Human Development, the School of Government and Business Administration,† and the School of Public and International Affairs, for the registered in the Division of University Students; and for courses taken on campus by graduate students in the College of General Studies:

For each semester hour for which a student registers	$ 117

* Payment of tuition for a master's thesis entitles the candidate, during the period of regis tration for the thesis and thereafter, to the services of the faculty under which the thesis is to be written. In case a thesis is unfinished, additional semester hours may be required in accordance with the regulations of the school in which the student is registered.

† Students entering doctoral programs in the School of Government and Business Administration in 1979-80 will be charged $9,000 for the entire degree program, to be paid in 10 semiannual installments. Contact the School's Doctoral Programs Office.

versity Center Fee (charged all students registered on campus)

students registered for 11 or more semester hours on campus:

ach semester 50.50

students registered for less than 11 semester hours in a semester campus:

or each semester hour for which the student registers 4.75

ditional Course Fees

certain courses additional fees, such as laboratory and material fees are rged as indicated in the course descriptions. These fees are charged by the ester and, unless otherwise indicated, may be defrayed in two payments n the tuition is paid in this manner. Breakage of apparatus is charged inst the individual student. When breakage is in excess of the normal unt provided for in the laboratory fee, the individual student will be re- red to pay such additional charges as are determined by the department cerned.

duation Fees

ociate in Arts $10.00

helor's, Master's, Education Specialist, Doctor's degrees 25.00

t-master's Graduate Certificate in Health Care Administration 25.00

for binding master's thesis 15.00

for microfilm service and printing announcement of final examination **(doctoral candidates)** 65.00

idence Hall Fees (see pages 59)

cial Fees and Deposits

plication fee (undergraduate degree candidate), nonrefundable 15.00

plication fee (graduate degree candidate), nonrefundable 25.00

-tered tuition deposit, nonrefundable, charged each entering or readmitted full-time undergraduate student 100.00

using deposit, nonrefundable, charged each applicant for residence all space 100.00

mission tests (when required) 6.00–12.00

ional Teacher Examinations fee, for Bachelor of Arts in Education egree candidates 9.00–13.00

registration fee, for failure to register within the designated eriod 15.00

-payment fee, for failure to make payments when due (see "Payment of Fees," page 31) 15.00

ancial reinstatement fee, for reinstatement after financial encumbrance for nonpayment of fees (see "Payment of Fees," page 31) 35.00

ned check fee, charged a student whose check is improperly ted, incomplete, returned by the bank for insufficient funds or any other reason 15.00

cial Columbian College of Arts and Sciences departmental examination for each course to qualify for receiving credit (advanced standing), waiver of requirement, or both 25.00

each waiver examination to qualify for advanced placement 5.00

lish test for international students (when required) 10.00

Laboratory checkout fee, for failure to check out of chemistry laboratory by the deadline date set by the instructor* 10

Transcript fee, for each transcript of record 2

If two or more transcripts are requested at the same time, fee for each of the first two copies is $2; fee for each additional copy...

Replacement of lost or stolen picture identification card 5

Registration for on-campus courses in the University entitles each stud to the following University privileges: (1) the services of the Stud and Alumni Career Services Office; (2) the use of the University Libra (3) gymnasium privileges; (4) admission to all athletic contests, unl otherwise specified; (5) subscription to the *University Hatchet*, the stud newspaper; (6) admission to University debates; (7) medical attention described under Student Health Service. These privileges terminate wi the student withdraws or is dismissed from the University.

Postdoctoral Study

George Washington University doctoral graduates may continue any stu in the University without payment of tuition, and enjoy all Univers library privileges. Such graduates are required to pay a nominal based on the prevailing credit hour rate for one semester hour, well as the University Center fee, in order to establish their active m bership in the University. The use of laboratory space and equipm is contingent upon availability, and the cost of all laboratory or spe library material is paid by the graduate. Special arrangements for s privileges must be made with the dean two months in advance the semester in which the graduate wishes to register. Postdoctoral w taken under this privilege may not be applied toward any degree offe by the University.

Projected Tuition and Fee Increases 1980-83

In order that students and their parents may plan more realistically f total four-year period, tuition increases for the academic years 1980 1981-82, and 1982-83 have been estimated as follows:

Increase by year (full-time undergraduate students):

1980–81	
1981–82	$20
1982–83	2

Increase by semester hour (graduate and part-time undergraduate students):

1980–81	
1981–82	$
1982–83	

It is not possible to project future economic data with certainty. increases outlined above are merely estimates based on present cir stances and should in no way be interpreted as fixed limits on tu

* A student who drops a chemistry course before the end of the semester must check out laboratory at the next laboratory period.

increases. The University hopes to keep tuition increases as low as possible, but it is obligated to maintain a sound financial basis. Economic conditions in the recent past, particularly as they affect private educational institutions, have been extremely variable, and significant increases in tuition in excess of the above limits may be required.

Payment of Fees

No student is permitted to complete registration or attend classes until all charges are paid. Tuition and fees for each semester are due and payable in full at the Office of the Cashier at the time of each registration. Checks should be made payable to George Washington University, with the student identification number in the upper left-hand corner.

The Student Accounts Office has responsibility for billing and maintaining student accounts for tuition, various fees, and room and board charges. A student registered for six semester hours or more may sign a deferred payment contract with the Student Accounts Office at the time of each registration permitting payment of one-half of the total tuition and fees (except for fees payable in advance) at the time of registration and the remaining half on or before October 24, 1979 (for the fall semester), and March 5, 1980 (for the spring semester). Interest at the rate of 6 per cent per annum on the unpaid balance will be charged from the date of registration to the date payment is made.

Students receiving tuition assistance in the form of scholarships, government tuition contracts, or other forms of tuition awards are not permitted to sign deferred payment contracts unless the total tuition and fee charges exceed the value of the tuition awards by $300.00 or more. Under such circumstances the student may be permitted to pay one-half of the amount due at the time of registration and to defer the balance by signing a deferred payment contract.

Students who fail to make any payment when due will be automatically charged a $15 late-payment fee and will be subject to the interest charge of 6 per cent per annum. Accounts which become 30 days past due will be financially encumbered. In the event a student's account is financially encumbered, the student forfeits rights to the use of deferred payment contracts in future semesters, and the Student Accounts Office will notify the Registrar to withhold grades, future registration privileges, transcripts, diplomas and other academic information until the account is settled financially. Financial settlement will require payment in full of all amounts due to the University in addition to a financial reinstatement fee of $35.

Students auditing courses are subject to all fees charged to students registered for credit.

Prepaid and Deferred Payment Plans

Several commercial programs for parents who wish to pay for college on a monthly basis are available. Terms and conditions vary, but most provide life insurance policy in the contract. For specific details and applications, address inquiries to the following:

1. Girard Edu-Check Plan, 2nd and Chestnut Streets, Philadelphia, Pa. 19106
2. Richard C. Knight Insured Tuition Payment Plan, 6 St. James Avenue, Boston, Mass. 02100

3. The Tuition Plan, Inc., Concord, N.H. 03301

The University's Office of Student Financial Aid does not maintai supply of applications for these various programs, but will be happy provide guidance to students and parents.

Withdrawals and Refunds*

Applications for withdrawal from the University or for change in cl schedule must be made in person or in writing to the dean of the colle school, or division in which the student is registered. Notification to instructor is not an acceptable notice (see "Withdrawal," page 46).

In authorized withdrawals and changes in schedule, cancellations semester tuition charges and fees will be made in accordance with following schedule for the fall and spring semesters:

1. *Complete withdrawal from the University:*

FALL SEMESTER

Withdrawal dated on or before September 7, 1979	90 per
Withdrawal dated September 10 to September 21, 1979	75 per
Withdrawal dated September 24 to October 5, 1979	50 per
Withdrawal dated after October 5, 1979	

SPRING SEMESTER

Withdrawal dated on or before January 18, 1980	90 per
Withdrawal dated January 21 to February 1, 1980	75 per
Withdrawal dated February 4 to February 15, 1980	50 per
Withdrawal dated after February 15, 1980	

2. For a *change in status from full-time to part-time student* or for *pa withdrawal by a part-time student*, the above schedule applies to difference in charges between the original program and the adju program continuing in effect.
3. A student enrolled in an undergraduate full time program who d or adds a course and continues to be in a full-time program will hav financial adjustments of tuition made other than those involving c fees.
4. Regulations governing student withdrawals as they relate to resid hall and food service charges are contained in the specific lease arra ments.

In no case will tuition be reduced or refunded because of absence f classes.

Payment applies only to the semester for which a registration ch is incurred and will not be credited to another semester.

Authorization to withdraw and certification for work done will no given a student who does not have a clear financial record.

Students are encouraged to provide their own cash funds until can make banking arrangements in the community.

* Regulations concerning withdrawal and refunds for the summer sessions are stated *Summer Sessions Schedule.*

INANCIAL AID

OR UNDERGRADUATE STUDENTS*

eorge Washington University offers a program of financial assistance two basic types: awards for academic achievement without reference financial circumstances—honor scholarships; and scholarships, grants, ans, and employment based upon demonstrated financial need.

Honor Scholarships—George Washington University honor scholarships up to $1,000 for the academic year based entirely upon academic hievement and potential without regard to financial need, are restricted incoming freshmen and are extremely limited in number.

Need-based Aid—The University offers extensive programs of scholar-ips, grants, loans, and employment based upon demonstrated need. The niversity participates in the National Direct Student Loan, Basic Educa-onal Opportunity Grant, Supplemental Educational Opportunity Grant, d the College Work-Study programs.

Applications and supporting credentials for financial aid must be filed February 1 (entering freshmen) or March 1 (enrolled undergraduate or tering transfer students) preceding the academic year of the award r the fall semester; by November 1, for the spring semester; and April for the summer sessions.† A student must reapply for financial aid ch year.

Complete information concerning financial assistance is contained in e pamphlet "Student Financial Aid," which is available at the Office of udent Financial Aid, George Washington University, Washington, D.C. 052.

The following scholarships are available to students in Columbian ollege of Arts and Sciences, the School of Education and Human De-lopment, the School of Government and Business Administration, and e School of Public and International Affairs.

The George Washington University Board of Trustees Scholarships—ll- and partial-tuition scholarships, which begin in the fall semester and tend for four successive academic years, provided the holder maintains B average and continues to be in financial need. Candidates must plan select a curriculum leading to a bachelor's degree in any school listed ove. Students who have demonstrated outstanding ability in inter-cholastic speech and debate activities are eligible for the George F. enigan Scholarships in Debate which are included among these scholar-ips.

ther Scholarships

chievement Rewards for College Scientists (ARCS) Foundation, Inc., Scholarship

*For information concerning financial aid for students from foreign countries, see pages 38-39.
†Students who are enrolled in the University for at least eight semester hours in the immediately preceding spring semester or who have applied for financial aid for the following fall semester are eligible for consideration for Summer Sessions financial aid.

Sherman Page Allen Memorial Scholarship Fund (1966)
Alumni Scholarships
Mary J. Anderson Scholarship (1969)
Bache and Company Scholarships
Byron Andrews Scholarship (1920)
Henry N. Brawner, Jr., Foundation Scholarship Fund (1963)
Emma K. Carr Scholarships (1932)
Maria M. Carter Scholarship (1871)
Paul E. Casassa Memorial Foundation Scholarship (1968)
The Chesapeake and Potomac Telephone Company Scholarship (1978)
Columbian Women Scholarship Funds
Victoria Briggs Scholarship Fund (1959)
Elizabeth V. Brown Scholarship Fund (1925)
Grace Ross Chamberlin Scholarship Fund (1932)
College Women's Scholarship Fund (1926)
Columbian Women Members' Scholarship Fund (1961)
Arline Hughes Dufour Scholarship Fund (1961)
Dr. Watson W. Eldridge, Jr., and John F. Eldridge Scholarship Fu (1964)
Founders of Columbian Women Scholarship Fund (1920)
Rose Lees Hardy Foundation Scholarship Fund (1957)
Lillian Young Herron Scholarship Fund (1927)
Nellie Maynard Knapp Scholarship Fund (1915)
Marcia B. Kraft Scholarship Fund (1966)
Janet McWilliams Scholarship Fund (1954)
Marie-Louise Ralph Turner Scholarship Fund (1963)
D.C. Daughters of the American Revolution Scholarship (1952)
Isaac Davis Scholarship (1869)
District of Columbia Institute of Certified Public Accountants Scholars in Accounting (1964)
Estella Constance Drane Scholarship (1957)
Robert Farnham Scholarship (1871)
Federal Government Accountants Association—Washington, D.C., Cha —Scholarship in Accounting
Esther Brigham Fisher Scholarship (1951)
George Washington University Tennis Alumni Association Scholars (1974)
Mildred Green Memorial Scholarship Fund (1959)
Gridiron Foundation of the Gridiron Club Scholarship (1975)
Isadore and Bertha Gudelsky Family Scholarship (1978)
Anna Spöcker Hampel Scholarship (1949)
Julian O. Hargrove Scholarship (1968)
Elma Lewis Harvey Scholarship (1921)
Hazleton Scholarship (1950)
George F. Henigan Scholarships in Debate (1967)
International Student Scholarships (see pages 38-39)
David B. and James L. Karrick, Jr., Scholarship Fund (1968)
Samuel and Elizabeth Kay Scholarships (1969)
Amos Kendall Scholarship (1869)
L. Poe Leggette Memorial Scholarship Established by WRGW (1968)
Mary and Daniel Loughran Scholarship (1976)
Martha's Marathon Residence Hall Scholarship (1969)

A. Morehouse Scholarship (1861)
E. K. Morris Education Fund Scholarships (1972)
Helen Marie and Thomas E. Orr Scholarships (1965)
Hardy Pearce Scholarship Fund (1972)
Phi Delta Gamma Scholarships (1956)
Fred B. and Alma D. Pletcher Scholarship Fund (1968)
Levin M. Powell Scholarships (1886)
Research Assistantships in Operations Research and Related Fields (see page 36)
Resident Assistantships (see page 36)
Henry Whitefield Samson Scholarship Fund (1966)
Lula M. Shepard Scholarships (1946)
Sigma Delta Chi Foundation of Washington, D.C., Scholarships
Margaret Lucille Snoddy Scholarship (1970)
David Spencer Scholarship (1918)
Mary Lowell Stone Scholarship (1893)
Charles Clinton Swisher Scholarships (1941)
U.S. Office of Education Traineeships (1964)
University Players Scholarship in Memory of L. Poe Leggette (1968)
William Walker Scholarship (1824)
Abigail Ann Brown and Henry Kirk White Scholarship Fund (1963)
John Withington Scholarship (1830)
Women's Physical Education Alumnae Association Scholarship (1964)
William G. Woodford Scholarship (1969)
Ellen Woodhull Scholarship (1919)
Zonta Club Scholarship (1950)

Grants

The following funds have been established to meet the special needs of disadvantaged students from the District of Columbia Inner-City and the Washington metropolitan area.

George Washington University's Educational Opportunity Program Tuition Grants (1968)
Key Club of Walt Whitman High School, Bethesda, Md., Grant (1968)
Marriott Foundation Grant (1968)

FOR GRADUATE STUDENTS*

The George Washington University program of financial assistance for graduate students includes assistantships, fellowships, traineeships, graduate scholarships, research appointments, part-time employment, and loans. Application for admission to graduate study is a prerequisite for consideration.

Application and correspondence concerning assistantships, fellowships, traineeships, or graduate scholarships should be sent directly to the dean of the school concerned, and addressed to George Washington University, Washington, D.C. 20052. Unless otherwise specified, application and supporting credentials should be submitted no later than February 1 preceding the academic year for which the award is made.

* For information concerning financial aid for students from foreign countries, see pages 48-49.

Assistantships

Research Assistantships in Operations Research and Related Fields—Available to graduates, and to undergraduates on the junior and senio levels, in any school of the University. Research assistants are expecte to work 20 hours a week conducting research in support of an establishe research program, in programming or in conducting individual research o an approved research project. Stipends range up to $8,000, depending o the status of the student and the tenure of the appointment (9–12 months). Further information and applications are available from Director, Institut for Management Science and Engineering, School of Engineering and Ap plied Science, George Washington University, Washington, D.C. 20052.

Resident Assistantships (men and women)—Available to graduate stu dents and seniors in any field of study who are interested in working wi the student personnel program in University residence halls. Specific dutie vary with the position, but basically consist of counseling, advising stude groups, and administration. Remuneration includes partial tuition and furnished room for the academic year. All positions are part-time, a staff members are required to enroll as full-time students in degree gran ing programs. Further information may be obtained from the Office the Director of Housing.

Arlington County—George Washington University Cooperative Assistan ship Program
Health Care Administration Research Assistantships
National League of Cities/George Washington University Assistantship
Urban Affairs Assistantship

Fellowships, Internships, Traineeships, Special Programs

The following fellowships, internships, and traineeships are available students in the Graduate School of Arts and Sciences, the School of Educ tion and Human Development, the School of Government and Business A ministration, and the School of Public and International Affairs. The U versity also offers many other fellowships which are available to stude in these colleges and schools.

University Fellowships—Available to graduate students in master's a doctoral programs in most departments of the University. Fellowships based on scholarship and each fellow may receive a stipend, tuition allo ance, and course fees.

Graduate Teaching Assistantships—Available to graduate students master's and doctoral programs in most departments of the University. graduate teaching assistant receives financial compensation for a des nated unit of service to the assistant's major department of instructio

Research Traineeships—Available under numerous sponsored progra in a number of departments. Currently, the basic medical science dep ments and the Departments of Psychology and Speech and Drama o such programs. Stipends vary; information is available from the dep ments and the Office of the Dean of the Graduate School of Arts Sciences.

Achievement Rewards for College Scientists (ARCS) Foundation, In Fellowship
Robert A. Aleshire Fellowship Fund (1971)

American Association of Collegiate Schools of Business Fellowship
American Civilization Fellowships
American Civilization Internships (Smithsonian Institution-George Washington University Cooperative Program)
American Iron and Steel Institute Fellowship
Arthur Anderson & Co. Doctoral Fellowship
Aryamehr Research Fellowships
Winfield Scott Blaney Fellowship in International Affairs (1961)
Oliver T. Carr, Sr., Memorial Fellowship in Urban and Regional Planning (1973)
Thomas Alva Edison Fellowship
Elementary Teacher Education Internships
Ernst & Ernst Grant to Doctoral Candidates in Business or Economics
Health Care Administration Fellowships
International Student Fellowships (see pages 38-49)
Richard D. Irwin Doctoral Fellowships
Isabella Osborn King Research Fellowships (1927)
Louis D. Lasker Fellowships in Housing, City Planning, or Urban Renewal
Mary and Daniel Loughran Graduate Scholarship (1970)
Mellon Foundation Fellowships
Minorities in Planning and Related Professions Program
National Association of Purchasing Management Fellowship
National Historical Publications Commission-George Washington University Cooperative Research Fellowships
National Science Foundation Graduate Fellowships
Resources for the Future, Inc., Fellowship Prize
Rose Bibliography Internships
Thomas Bradford Sanders Fellowships (1928)
Scottish Rite Foundation Fellowships
U.S. Office of Education Fellowships (1964)
U.S. Public Health Service Traineeships
U.S. Public Health Service Traineeships in Comprehensive Health Planning
Urban Studies Fellowships of the Department of Housing and Urban Development
Urban Transportation Center Fellowship

Graduate Scholarships

Armed Forces Health Professions Scholarship Program (The Uniformed Services Health Professions Revitalization Act of 1972—Public Law 92-426)
Barbee Sculptor Scholarship (1975)
Eugene K. Carr Scholarships (1972)
Paul H. and Margaret M. DeMarco Scholarships (1967)
Division of Colorado Institute of Certified Public Accountants Scholarship in Accounting (1964)
Mary and Daniel Loughran Graduate Scholarship (1976)
Frances G. McGee Scholarship in Health Care Administration (1971)
Maxwell-Stancioff Scholarship (1967)
Paul Pearson Scholarship Fund (1940)
Phi Delta Gamma Scholarship Fund (1968)
Voorhees Scholarships
Wolcott Foundation Scholarships

Sponsored Awards for Graduate Study

Information regarding awards sponsored by foundations, professional an learned societies, industries, and others which may be used in support o graduate study is available at the Graduate Fellowship Information Cen ter, 2025 H St., N.W., for students enrolled at George Washingto University. Information is also available on distinguished programs such a the Rhodes, Marshall, National Science Foundation, Fulbright, Rotar International, and Danforth, as well as many others.

As deadlines for application vary, qualified students should make in quiries well in advance of the year of planned graduate study.

LOAN FUNDS

The following loan funds are available to undergraduate and/or gradua students in Columbian College of Arts and Sciences, the Graduate Scho of Arts and Sciences, the School of Education and Human Development, the School of Government and Business Administration, and the Scho of Public and International Affairs. A separate application must be sub mitted for all loan programs. Applications for the National Direct Stude Loan should be filed no later than April 1 for the following academic yea Complete information is contained in the pamphlet "Student Financi Aid," which is available in the Office of Student Financial Aid, Georg Washington University, Washington, D.C. 20052.

American Medical Association Nursing Home Administration Loan Fund
George F. Henigan Loan Fund (1975)
International Student Loan Fund (1967)
Joanne Jacobs Student Loan Fund (1974)
W. K. Kellogg Foundation Hospital Administration Loan Fund
Jessie B. Martin Loan Fund (1967)
National Direct Student Loan Program
Ellis H. Stearman Emergency Loan Fund
Hirani Miller Stout Memorial Loan Fund (1973)
University Student Emergency Loan Fund

STUDENT EMPLOYMENT

The University participates in the College Work-Study Program. Inquiri should be addressed to the Office of Student Financial Aid. In addition, t Student and Alumni Career Services Office maintains a registry of be full-time and part-time positions available in the Washington area f undergraduate and graduate students.

After registration, students may apply at the Student and Alumni Car Services Office, Woodhull House, 2033 G Street, N.W., for interviews a referrals to positions for which they are qualified.

INTERNATIONAL STUDENTS

Undergraduate international students with proven financial need who h completed one semester of full-time work (15 hours) at this Univer

with a *B* average are eligible to apply for the Board of Trustees Scholarships. Scholarships are awarded in the spring for the following academic year. See instructions for applying for undergraduate financial aid, page 33.

Limited awards for graduate teaching assistantships and University fellowships are the responsibility of the chairman of the department or dean of the school in which the degree is to be earned. Work as a teaching fellow requires excellent knowledge of English—both spoken and written.

Long-term loan funds for undergraduate and graduate international students are limited in amount and are available only to those foreign-born persons who have established resident status in the United States through the Immigration and Naturalization Service.

We suggest that students who wish to study in the United States have available sufficient funds to cover expenses for one full year before attempting to enter a college or university. The cost at this University for one academic year (September-May) is approximately $6,000. This estimate includes room and board, tuition, books, clothes, and incidental expenses; no travel, holiday, or medical expenses are included.

LAW ENFORCEMENT EDUCATION PROGRAM

This program of grants and loans, authorized under the provisions of the Omnibus Crime Control and Safe Streets Act of 1968, is intended to help pay the cost of educational expenses for employees of state and local criminal justice agencies. Studies may be full- or part-time in a wide range of subject areas and degree goals. Applications and further information are available from the LEEP Coordinator, Graduate School of Arts and Sciences.

PRIZES

Accounting Prizes—Three prizes awarded annually by the Department of Accounting—one each to the undergraduate Accounting major with the highest scholastic standing, to the candidate for the degree of Master of Business Administration with the highest scholastic standing in the Accounting concentration, and to the Doctoral candidate with a field in Accounting who has the highest scholastic standing at the completion of the General Examination.

Alpha Chi Sigma Prize—Awarded annually by the Alpha P. Chapter to the student who has attained the highest academic record in courses in chemistry. The name and year of graduation of the student is inscribed on a bronze plaque. The winner must have had at least 16 hours in chemistry, including the final semester at this University.

American Chemical Society Prize—Awarded to an undergraduate stu
dent who has completed the junior year and who has demonstrated ex
cellence in analytic chemistry.

American Institute of Chemists Prize—A medal awarded annually to th
graduating student majoring in chemistry who excels in scholarship, in
tegrity, and leadership.

Department of Art Prizes—Two prizes—one for an undergraduate major
ing in Art History and one for an undergraduate majoring in Fine Arts—
awarded annually to the most promising students, as determined by the
departmental faculty.

The Walter G. Bryte, Jr., Achievement Award—Provided by Walter G
Bryte, Jr., Colonel, U.S. Air Force (retired), first Professor of Air Science a
George Washington University. The award is presented annually primarily
to that undergraduate residence hall secondarily to any other activity
the University, which has shown under the leadership of its elected o
designated head, the most improvement or excellence in its support of th
principles and aims of the United States of America and George Wash
ington University. The hall or other activity will be awarded a cash prize
and the name of its leader and the hall or activity will be engraved on
silver trophy.

Byrne Thurtell Burns Memorial Prize—Awarded to the senior majoring i
chemistry who shows the greatest proficiency in organic chemistry, as ev
denced by a comprehensive examination, and who possesses such qualities
tions of mind, character, and personality as to give promise of futur
achievement.

Business Administration Prize—Awarded annually by the Department
Business Administration to the outstanding graduating senior in busines
administration on the basis of scholarship, leadership and service to th
University.

Wilbur J. Carr Prize—Established in 1962 by Edith K. Carr, former Trus
tee of the University, in memory of her distinguished husband, who was
graduated from the School of Comparative Jurisprudence and Diplomacy
in 1899. It is awarded annually to that student in the graduating class
the University who has demonstrated outstanding ability in the study
international affairs and who has given evidence of possessing in mark
degree the qualities which produce the good citizen and the dedicate
public servant.

Chemical Rubber Company Freshman Chemistry Achievement Prize
A Handbook of Chemistry and Physics awarded annually to the freshma
student who has demonstrated the greatest achievement in Chemistry 15-

Chemical Society of Washington Prize—Awarded to an outstandi
undergraduate in the junior year who is majoring in Chemistry.

John Henry Cowles Prizes—Two prizes established by John H. Cowle
Grand Commander of the Supreme Council of Thirty-third Degree (Mother
Council of the World) of the Ancient and Accepted Scottish Rite of Fre
masonry, Southern Jurisdiction of the United States of America. Awarde
annually to the senior in the School of Government and Business Ad
ministration and to the senior in the School of Public and International
Affairs with the highest academic averages.

DeWitt Clinton Croissant Prize—Awarded annually to the undergradua
student enrolled in a course in drama or active in University dramatics wh

submits to the English Department the best essay on drama or the theater.

E.K. Cutter Prize—Established by Marion Kendall Cutter "for excellence in the study of English." Awarded to the member of the graduating class whose record in English, combined with general excellence, shows most marked aptitude for and attainment in English studies.

Isaac Davis Prizes—Established in 1847 and awarded annually to the three seniors who have made the greatest progress in public speaking while enrolled in the University. Awards are to be determined by a public-speaking contest in which the participants deliver original orations. Only members of the senior class of Columbian College of Arts and Sciences who are candidates for the degree of Bachelor of Arts or Bachelor of Science are eligible to compete.

Henry Grattan Doyle Memorial Prize—Established in memory of Henry Grattan Doyle, a former Dean of Columbian College. Awarded annually to an outstanding senior for excellence in Spanish.

Elton Prize—Established by the Reverend Romeo Elton, of Exeter, England, and awarded annually to the student with the highest average in the most advanced course in the Greek language and literature.

Jesse Frederick Essary Prize in Journalism—Established by Helen Essary Murphy and awarded annually to a student who has given promise of sound citizenship and who submits the best printed and published evidence of ability in "forthright reporting" and good journalistic writing, in a student publication or elsewhere.

Joshua Evans III Prize in Political and Social Sciences—A memorial prize "established by friends because of an outstanding life." Awarded annually to that student in the graduating class who has demonstrated his/her signal ability in the social and political sciences and who has given promise of the interpretation of that ability in good citizenship among his/her fellows."

Willie E. Fitch Prize—Established by James E. Fitch in memory of his son. Awarded annually to a senior student for the best examination in chemistry.

Charles E. Gauss Prize—Established in honor of Charles E. Gauss, Elton Professor of Philosophy from 1945 to 1961. Awarded annually to a graduating senior for excellence in philosophy.

Alice Douglas Goddard Prize—A memorial established by Frederick Joseph Goddard, of Georgetown, D.C. Awarded annually to the senior student making the highest average in American literature.

Edward Carrington Goddard Prize—Established by Mary Williamson Goddard, Alice Douglas Goddard, and Frederick Joseph Goddard, of Georgetown, D.C., in memory of Edward Carrington Goddard, Class of 1891. Awarded to the junior or senior student making the highest average in the French language and literature.

Morgan Richardson Goddard Prize—A memorial established by Mary Williamson Goddard, Alice Douglas Goddard, and Frederick Joseph Goddard, of Georgetown, D.C. Awarded to the junior or senior student making the highest average in the following fields: business administration, economics, international business, or public accounting.

Government Employees Insurance Company and Affiliates Achievement Awards—A $500 cash award is given to an outstanding sophomore or junior majoring in any one of the several designated fields of study: accounting, economics, English, and management science.

Gardiner G. Hubbard Memorial Prize in United States History—Established by Gertrude M. Hubbard in memory of her husband and awarded annually to that member of the graduating class majoring in history who has maintained the highest standing in courses in United States history.

International Business Prize—Two prizes awarded annually by the School of Government and Business Administration to students specializing in international business, one awarded to a graduating senior and one awarded to a graduate student.

David Lloyd Kreeger Prizes in Art—Five prizes given by Mr. Kreeger three in the fine arts and two in art history (including museology). Fine arts prizes are awarded to a senior or graduate student in painting, sculpture, and graphics or design. One prize in art history is awarded to a senior and one to a graduate student. Candidates for the prizes must submit original papers or works of art. Winners are selected by distinguished representatives of the field of art in the Washington, D.C., area.

Minna Mirin Kullback Memorial Prize—Established in 1968 by Solomon Kullback in memory of his wife. Awarded annually by a committee of faculty members of the Department of Statistics to a full-time undergraduate or graduate student majoring in statistics, who will have completed 18 semester hours of statistics courses by the end of the spring semester.

John Francis Latimer Prize in Classics—Established in 1973. Awarded to a graduating senior who has made the most outstanding record as a major in the Department of Classics.

Hilda Haves Manchester Prize in Sociology—Established in honor of Hilda Haves Manchester, B.A. 1932, an outstanding student whose major field was sociology. Awarded annually by Columbian College of Arts and Sciences to the senior student majoring in sociology who has the highest scholastic record.

Vivian Nellis Memorial Prize—Awarded to a student in the English Department who has shown special promise in the field of creative writing.

Phi Delta Kappa Prize—Awarded annually by the George Washington University Chapter to an outstanding senior in the teacher education program in the School of Education and Human Development.

Phi Delta Kappa Research Prize—Awarded annually by the George Washington University Chapter to a graduate student, for an outstanding research project.

Phi Eta Sigma Prize—A choice book selected from the field of the recipient's major, awarded annually by the George Washington University Chapter to the student attaining the highest scholastic average in the first full semester of work. The winner's name is engraved on a plaque in the Office of the Dean of Columbian College of Arts and Sciences.

Pi Lambda Theta Prize—Awarded annually by Alpha Theta Chapter to an outstanding senior in the teacher education program in the School of Education and Human Development.

Psi Chi Prizes—Two prizes awarded annually by the George Washington University Chapter to the best undergraduate student in experimental psychology and to the M.A. degree candidate or second-year graduate student submitting the best thesis or research project in psychology.

Ruggles Prize—Established by Professor William Ruggles in 18[illegible] awarded annually to a candidate for a bachelor's degree for excellence in mathematics.

Hermann and Johanna Richter Schoenfeld Prize—Established in grateful appreciation of the inspired teaching and devotion to his students of Dr. Hermann Schoenfeld, who for more than 20 years until his death in 1926 headed the Department of German. Hermann Schoenfeld, Ph.D., LL.D., was widely recognized as a scholar of distinction whose presence on the faculty added prestige to the University. This prize is given annually to a member of the graduating class for excellence in historical and cultural phases of German studies.

Society of Colonial Wars in the District of Columbia Prize—A gold medal awarded to a candidate for a graduate degree who, in the judgment of the faculty of the Department of History, submits a thesis or dissertation demonstrating excellence in historical research in American Colonial history. The University reserves the right to withhold the award if no thesis or dissertation attaining the required degree of excellence is submitted.

Staughton Prize—Established by the Reverend Romeo Elton and awarded annually to the student making the best record in the most advanced courses in the Latin language and literature.

James MacBride Sterrett, Jr., Prize—Established in 1911 by Professor Sterrett in memory of his son. Awarded annually to the student who obtains the highest average in Physics 1 and 2.

Charles Clinton Swisher Historical Club Prize—Established in 1936 by the Charles Clinton Swisher Historical Club and augmented in 1941 by the bequest of Professor Swisher. Awarded annually to the student who submits the best essay covering some phase of medieval history.

James H. Taylor Graduate Mathematics Prize—Established in memory of James H. Taylor, former Professor of Mathematics at the University. Awarded annually to a graduate student for outstanding performance in mathematics.

Benjamin D. Van Evera Memorial Prize—Awarded annually to that Graduate Teaching Fellow in Chemistry selected as the most effective teacher during the current academic year.

The Wall Street Journal Leadership Prize—Awarded annually to a graduating senior in the Bachelor of Business Administration degree program for outstanding leadership and service to the University.

Thomas F. Walsh Prize—Established in 1901 and awarded annually to the student who submits the best essay in Irish history.

The Washington Society of Investment Analysts Award—A $500 award given to a full-time candidate for the Master of Business Administration degree who is interested in finance and investments, has a high undergraduate academic record, and demonstrates financial need.

Alexander Wilbourne Weddell Prize—Established in 1923 by Virginia Chase Weddell in memory of her husband. Awarded annually to a degree candidate who writes the best essay on "the promotion of peace among the nations of the world." The prize essays shall become the property of the University and shall not be printed or published without the written consent of the University. The University reserves the right to withhold the award if no essay attaining the required degree of excellence is submitted.

Women's Transportation Seminar Prize—Awarded annually by the Women's Transportation Seminar to an outstanding student specializing in transportation in the School of Government and Business Administration.

REGULATIONS

Students enrolled in the University are required to conform to the follo
ing regulations and to comply with the rules and regulations of the colle
school, or division in which registered.

Students who withdraw or are suspended, or who, for any other reas
are not registered at the University for one semester or more, may re-en
and continue work only under the regulations and requirements in fo
at the time of return.

If a student knowingly makes a false statement or conceals mater
information on an application for admission, registration card, or any oth
University document the student's registration may be canceled. If su
falsification is discovered after the student has established an acade
record at the University, the student may be subject to dismissal fr
the University. Such a student will be ineligible (except by special acti
of the Faculty) for subsequent registration in the University.

ATTENDANCE

Students may not attend classes until registration is completed and fe
due are paid. They may attend only those classes for which they a
registered. Regular attendance is expected. Students may be dropped fr
any course for undue absence.

SCHOLARSHIP REQUIREMENTS

Students who fail to maintain the scholarship requirements of the colle
school, or division in which registered may be dismissed from the Un
versity.

Grades

Grades are mailed to students through the Office of the Registrar at th
close of each semester. They are not given out by instructors.

UNDERGRADUATE

The following grading system is used: *A*, Excellent; *B*, Good; *C*, Satisf
tory; *D*, Low Pass; *F*, Fail; *I*, Incomplete; *IP*, Progress; *W*, Authorized W
drawal; *Z*, Failure, Unauthorized Withdrawal; *CR*, Credit; *NC*, No Cred
Except for courses which specifically state that repetition for credit
permitted, a candidate for a degree at this University may not repeat f
credit a course in which a grade of *D* or better was received, unless
quired to do so by the department concerned. A written statement
this effect must be submitted to the Registrar by the appropriate depa
ment chairman.

GRADUATE

The following grading system is used: *A*, Excellent; *B*, Good; *C*, Minimum Pass; *F*, Fail; *I*, Incomplete; *H*, Progress; CR, Credit; W, Authorized Withdrawal; Z, Failure, Unauthorized Withdrawal. Except for courses which specifically state that repetition for credit is permitted, a candidate for a degree at this University may not repeat for credit a course in which a grade of *C* or above was received, unless required to do so by the department concerned. A written statement to this effect must be submitted to the Registrar by the appropriate department chairman.

INCOMPLETE/AUTHORIZED WITHDRAWAL

When another grade has not been assigned, the symbol *I* (Incomplete), the symbol W (Authorized Withdrawal), or the symbol Z (failure because of unauthorized withdrawal) will be recorded. The symbol *I* indicates that a satisfactory explanation has been given for failure to complete the required work of the course. At the student's inability to complete the required work of the course. At the option of the instructor, the grade of *I* may be recorded if a student, for reasons beyond the student's control, is unable to complete the work of the course, and if the instructor is informed of, and approves, such reasons before the date when grades must be reported. The grade may be used only if the student's prior performance and class attendance in the course have been satisfactory. Any failure to complete the work of a course which is not satisfactorily explained to the instructor before the date when grades must be turned in will be graded *F*. If acceptable reasons are later presented to the instructor, that instructor may initiate an appropriate grade change.

REMOVING AN INCOMPLETE

For information concerning the removal of a grade of Incomplete from a student's record, consult the regulations of the college, school, or division concerned.

THE QUALITY-POINT INDEX

Scholarship is computed in terms of the quality-point index obtained by dividing the number of quality points by the number of semester hours for which the student has registered, both based on his or her record in this University. Quality points are computed from grades as follows: *A*, four points; *B*, three points; *C*, two points; *D*, one point; *F*, no points, for each semester hour for which the student has registered. Courses marked W, *I*, *IP*, *NC*, or *CR* are not considered in determining the index, except that courses marked *I* will be considered when a formal grade is recorded. With the exception of Consortium courses, grades in courses taken at other institutions are not considered in computing the quality-point index.

Final Examinations

Final examinations for undergraduate courses are scheduled by the Office

of the Registrar. Examinations for courses numbered 201 or above are scheduled, if desired, by the individual department or instructor.

Academic Dishonesty

The University community, in order to fulfill its purposes, must establish and maintain guidelines of academic behavior. All members of the community are expected to exhibit honesty and competence in their academic work. Incoming students have a special responsibility to acquaint themselves with, and make use of, all proper procedures for doing research, writing papers, and taking examinations.

Members of the community will be presumed to be familiar with the proper academic procedures and held responsible for applying them. Deliberate failure to act in accordance with such procedures will be considered academic dishonesty. Acts of academic dishonesty are a legal, moral, and intellectual offense against the community and will be prosecuted through the proper University channels.

Copies of the University policy on academic dishonesty can be obtained from the following officers: all department chairmen, all academic deans, and the Vice President for Academic Affairs.

STUDENT CONDUCT

All students upon enrolling and while attending The George Washington University are subject to the provisions of the *Statement of Student Rights and Responsibilities* which outlines student freedoms and responsibilities of conduct, the Judicial System for Non-Academic Student Discipline, and other policies and regulations as adopted and promulgated by appropriate University authorities. Copies of these documents may be obtained at the Office of the Vice President for Student Affairs. Sanctions for violation of these regulations may include permanent expulsion from the University which may make enrollment in another college or university difficult. Regulations or requirements applicable only to a particular program, facility, or class of students may not be published generally, but such regulations or requirements shall be published in a manner reasonably calculated to inform affected students.

WITHDRAWAL

Withdrawal from a course or from the University requires the permission of the dean of the college, school, or division in which the student is registered. Permission to withdraw from the University will not be granted a student who does not have a clear financial record (see "Payment of Fees").

Each college, school, and division of the University sets deadline dates for each semester concerning withdrawal. Withdrawal between these dates and the end of the semester is permitted only in exceptional circumstances.

All charges for courses dropped without the approval of the dean must be met by the student. Such unauthorized withdrawal will result in the recording of a failing grade for the course or courses.

CHANGES IN PROGRAM OF STUDY

Changes within a College, School, or Division—A student may not substitute one course for another, drop courses (see "Withdrawal" above), change status from credit to audit or from audit to credit without the approval of the dean of the college, school, or division in which registered.

Change from one section to another of the same course may be made with the approval of the dean and the department concerned.

Change from one major field to another within the same college or school may be made with the approval of the dean.

Transfer within the University—Application for transfer to another college, school, or division must be made to the appropriate admitting officer on the form provided by the deans concerned. Transfer from the appropriate preprofessional curriculum in Columbian College to bachelor's degree candidacy in the School of Public and International Affairs may take place upon the completion of 60 or more semester hours of course work and of the necessary procedures required by the particular school.

With the exception of the School of Government and Business Administration which limits a student to 15 semester hours earned in nonmatriculated status, a maximum of 45 semester hours earned in the Division of University Students may be applied toward a bachelor's degree in the other degree-granting colleges or schools of the University. Work done in the Division of University Students will not be counted toward a graduate degree unless prior written approval, obtained from the relevant degree-granting college or school, has been filed in the Office of the Dean of the Division of University Students (see page 178).

Students transferring within the University are advised to study carefully the requirements listed below under the heading "Graduation Requirements," and to note that, unless otherwise specified in all undergraduate divisions, 30 semester hours, including at least 12 semester hours in the major field, must be completed while registered in the school or college from which the degree is sought. Upon transfer the student should consult the dean concerned and understand clearly the requirements which must be fulfilled.

CREDIT

Credit is given only after registration for a course and satisfactory completion of the required work, or upon the assignment of advanced standing in accordance with the regulations of the several colleges, schools, and divisions.

Auditing—A person who has been admitted to the University may be registered, with the permission of the instructor, as an auditor in a class (no academic credit). An auditor is not required to take active part or to pass examinations. A student who takes a course as an auditor may not repeat it later for credit.

POST-ADMISSION TRANSFER CREDIT

Students who plan to attend another institution and apply credit so earned toward graduation from this University, must first secure the written ap-

proval of their dean. In no event will credit in excess of what might be earned in a similar period in this University be recognized.

BALANCE SHEET

On request, the Office of the Registrar will issue to undergraduate degree candidates a balance sheet showing the amount of work completed and the requirements remaining to be met for the degree. A second balance sheet is issued only if the student changes major or degree objectives.

TRANSCRIPTS OF RECORD

Official transcripts of student records are issued on written request of the student or former student who has paid all charges, including any student loan installments, due the University at the time of the request. A fee of $2 is charged for each transcript. When more than two transcripts are ordered at the same time, a $2 fee is charged for each of the first two transcripts and a $.50 fee is charged for each additional transcript. Partial transcripts are not issued.

CONTINUOUS ENROLLMENT

Once entered in a degree program, a student is expected to be continuously enrolled and actively engaged in fulfilling the requirements for the degree each semester of the academic year until such time as the degree is conferred. Should the student break continuous enrollment at the University and not request and be granted a leave of absence (see below) or be assigned by the dean to inactive status (see below) he or she must apply for readmission and, if granted, be subject to the requirements and regulations then in force.

LEAVE OF ABSENCE

Should a degree student find it necessary to interrupt active pursuit of the degree, he or she may petition the dean for a leave of absence for a specific period of time, generally limited to one calendar year. A degree student who discontinues active enrollment in degree studies without being granted a leave of absence, or a student granted a leave who does not return to active study at the close of the period of approved absence must apply for readmission and be subject to the regulations and requirements then in force. No fees are assessed students while on leave of absence.

INACTIVE STATUS

Under the regulations established by each school and college, a student may be considered in continuous pursuit of the degree while not enrolled in courses at the University when engaged in the following: cooperative

engineering work semester; "year abroad program;" attendance at another institution with prior approval to have work transferred back to the GW program; completion of outstanding work in courses in which a grade of "Incomplete" was received; or non-course instructional activities unique to the particular school or college.

To be enrolled in inactive status a student must request, in advance of the year or semester concerned, and be granted approval for the specific activity desired. This status is generally limited to one year; no fees are assessed students while in this status.

GRADUATION REQUIREMENTS

Degrees are conferred in February, May, and September.

To be recommended by the Faculty for graduation a student must have met the admission requirements of the college or school in which registered; completed satisfactorily the scholarship, curriculum, residence and other requirements for the degree for which registered; and be free from all indebtedness to the University. Enrollment is required for the semester or summer session at the close of which the degree is to be conferred.

Application for Graduation—An "Application for Graduation" form must be filed and the appropriate fee paid at the time of registration for the last semester or summer session of the senior or final year. Students completing degree requirements during the Summer Sessions will be awarded diplomas (no formal convocation) dated September 30, *provided* they have completed all degree requirements and have applied for graduation as a part of registration for the Summer Sessions.

Scholarship—The student must meet the scholarship requirements for the particular degree for which registered.

Curriculum—Minimum curriculum requirements for each degree are stated under the college or school offering work in preparation for the degree.

Residence—Unless otherwise specified, in all undergraduate divisions of the University, a minimum of 30 semester hours, including at least 12 hours in the major field, must be completed while registered in the school or college from which the degree is sought. This requirement applies to students transferring within the University as well as to students transferring from other institutions. Unless special permission is granted by the dean of the college or school concerned to pursue work elsewhere, the work of the senior or final year must be completed in the college or school from which the degree is sought.

The graduate student must meet the residence requirements for the particular degree for which registered.

Attendance and Conduct—The University reserves the right to refuse to confer a degree upon a candidate whose attendance or conduct has been unsatisfactory.

Thesis or Dissertation—A thesis or dissertation submitted in partial fulfillment of requirements for a degree must be presented in its final

form to the dean of the college or school concerned no later than the dat specified in the University Calendar.

Accepted theses and dissertations, with accompanying drawings, be come the property of the University and are deposited in the Universit Library, where the duplicate copies are bound and made available fo circulation. See the appropriate college or school in this catalogue fo regulations governing theses and dissertations.

HONORS

WITH DISTINCTION

In all undergraduate divisions of the University a baccalaureate degree may be conferred "With Distinction," at the discretion of the faculty, if a student meets the specific requirements of the student's college or school as follows:

1. Columbian College of Arts and Sciences or School of Public and International Affairs—the attainment of the grades of *A* in 60 per cent of the courses taken at GW; or

2. School of Education and Human Development or School of Government and Business Administration—the attainment of a quality-point index of 3.50 or higher in all course work taken at GW.

To be eligible a student must have completed at this institution at least one-half of the courses required for the degree.

SPECIAL HONORS

Special Honors may be awarded by the faculty to any member of the graduating class for outstanding achievement in the student's major field on recommendation of the major department. The student must fulfill all of the following requirements:

1. Candidacy for Special Honors must be approved by the faculty member representing the major department or field not later than the beginning of the senior year.

2. Such other conditions as may be set at the time the candidacy is approved must be met.

3. At least one-half of the courses required for the degree must have been completed at GW.

4. The specific requirement of the college or school in which registered must be fulfilled, as follows: (a) Columbian College of Arts and Sciences or the School of Public and International Affairs—grades of *A* or *B* in 50 per cent of the courses taken at GW; or (b) the School of Education and Human Development or the School of Government and Business Administration—a quality-point index of at least 3.0 on all course work taken at GW.

DEPARTMENTAL HONORS

The Department of History offers Departmental Honors if students meet specific requirements. For details, see the Department of History, page 334.



below. Information may be furnished to a student's parents without such written consent only upon certification of the student's financial dependency; and

4. comply with a judicial order or lawfully issued subpoena to release a student's record, notifying the student of this action.

The University will release the following directory information upon request: name, local address, and telephone number; name and address of next of kin; dates of attendance; school, college, or division of enrollment; field of study; credit hours earned, degrees earned; honors received; participation in organizations and activities chartered or otherwise established by the University (including intercollegiate athletics); and height and weight of members of athletic teams. A student who does not wish such directory information released must file written notice to this effect in the Office of the Registrar.

Copies of the University's full policy statement on the release of student information may be obtained from the Office of the Registrar.

PROPERTY RESPONSIBILITY

The University is not responsible for the loss of personal property. A Lost and Found Office is maintained on campus in the Safety and Security Office.

UNIVERSITY POLICY ON DRUGS

The University cannot condone violations of law, including violation of those laws which proscribe possession, use, sale, or distribution of drugs. Members of the academic community should know that administrative action, which may include dismissal from the residence halls, revocation of other privileges, or suspension or dismissal from the University, may be taken in order to protect the interests of the University and the rights of others.

ASSOCIATIONS AND SERVICES

CONSORTIUM OF UNIVERSITIES OF THE WASHINGTON METROPOLITAN AREA, INC.

The universities in Washington, D.C.—American University, Catholic University of America, George Washington University, Georgetown University, Howard University, and the University of the District of Columbia—are associated in a Consortium through which they coordinate the use of their respective facilities: Gallaudet College, Mount Vernon College, and Trinity College are associate members of the Consortium. Students in approved programs leading to degrees in any one of these institutions

have the opportunity to select from the combined offerings of all the particular courses which best meet their needs.

Participation is limited to degree candidates. The following, however, are excluded: students in canon law, dentistry, medicine, and theology. Law students are also excluded from participation, except for candidates for the degree of Master of Laws at George Washington University and Georgetown University.

In special courses involving private instruction (such as music or art) or tutorial study, if a special fee is charged, this fee is not covered by the Consortium agreement and must be paid by the individual student to the institution administering the course.

Students are encouraged to study the announcements of programs of all the participating institutions. See page 28 for information concerning registration for Consortium courses.

Registration forms and instructions are available from the registrar of the institution in which the student is enrolled. Students register and pay tuition at their own institutions for all Consortium courses; course fees are payable to the visited institutions.

THE SPEECH AND HEARING CLINIC

Director of Speech Pathology and Audiology J.W. Hillis

The Speech and Hearing Clinic offers diagnostic and remedial work for children and adults with such communication difficulties as stuttering, lisping, cleft-palate speech, and cerebral-palsied speech; and with voice, articulatory, and hearing problems. Diagnostic and remedial work is also available for persons with nonstandard language usage due to such conditions as hearing loss, brain damage, mental retardation, and environmental factors.

Fees.—For full-time George Washington University students the fee for an initial evaluation is $17.50, and for individual speech or hearing therapy, up to $10 per session. Fees for additional specialized testing are dependent on the testing involved. Others should contact the Clinic regarding the fee schedule. Fees are payable at the Clinic.

THE READING CENTER

Director F.E. Hesser

The Reading Center offers individual diagnostic and corrective services for all levels: primary, elementary, secondary, and adult. In addition, special reading improvement classes are conducted for high school and college students as well as other adults. Instruction is available on an individual, semi-individual, and small-group basis.

A complete diagnosis includes psychological tests; vision, hearing, dominance, and spelling tests; and various types of reading achievement and aptitude tests. Results are interpreted, and a written report is presented in conference with the parents or the individual.

The special reading improvement classes for high school students, college students, and other adults are offered throughout the year at stated

intervals. Emphasis is placed on improvement of vocabulary, speed, comprehension, and study skills. Instruction in spelling is also provided as needed. Mechanical aids such as the tachistoscope, rate accelerator, and controlled reader are available for increasing speed of comprehension.

Fees—The fee for full-time George Washington University students and alumni for reading classes (15 two-hour sessions) is $90. Others should contact the Center regarding the fee schedule. All fees are payable in advance at the Reading Center.

Reading instruction is required for first-year undergraduate students with insufficient reading skills who are taking English 9.

VETERANS BENEFITS

The Veterans Counselor's office, located on the fifth floor of Rice Hall, 2121 Eye St., N.W., assists students entitled to educational benefits as veterans or as widows or children of deceased or totally disabled veterans with any problems which may arise concerning their benefits. This Office also processes certification of enrollment and attendance to the Veterans Administration so that educational allowances will be paid.

When feasible, students entitled to benefits as veterans or dependents of veterans should consult with the veterans counselor prior to submitting application to the Veterans Administration. All such students should obtain the instruction sheet issued by the veterans counselor which sets forth requirements to be fulfilled before certification of enrollment can be made to the Veterans Administration and which includes other information of general interest.

The Veterans Administration is at 941 N. Capitol St., N.E., Washington, D.C. 20421.

ROTC

George Washington University students may enroll in the Army ROTC program offered at Georgetown University, the AFROTC program at the University of Maryland, or the Army ROTC or AFROTC at Howard University. Those interested should contact the ROTC enrollment officer at one of these universities. Credit for such courses may be transferable to George Washington University; prior approval is required by the dean of the school in which the student is enrolled.

CENTER FOR ACADEMIC AND ADMINISTRATIVE COMPUTING

Director F. William Rambo

The Center for Academic and Administrative Computing is located on the third floor of Lisner Hall, 2023 G St., N.W. The computer and other operational supportive services are located on the first floor of Stuart Hall, 2013 G St., N.W. These facilities normally are available 24 hours a day, seven days a week, to all qualified faculty, staff, and students.

The Center provides computational facilities, conducts seminars, consults with users, and provides operational assistance as required. The

Center operates an IBM 370 148 (OS VS1) central processing unit and a PDP 11 minicomputer which provides terminal and card remote-job-entry (RJE) to the 370 148 for students. There is a full range of compilers and application software packages.

Computer programming courses are offered by the School of Government and Business Administration, the Department of Statistics, and the School of Engineering and Applied Science. In addition, many other departments offer courses that utilize the computer as a research adjunct to course work.

CONTINUING EDUCATION FOR WOMEN

Continuing Education for Women Center, Suite 621-24, University Library, offers individual and group counseling services as well as credit and noncredit courses and career training programs. Brochures are available.

GENERAL ALUMNI ASSOCIATION

The objectives of this association are to unite the graduates who wish to associate themselves for charitable, educational, literary, and scientific purposes, and to promote the general welfare of the University.

Eligible members are those who have enrolled in any school of the University and who have left the University in good standing, or any person who is or has been a member of the teaching, research, or administrative staff of the University, or of the Board of Trustees of the University. Active members are those who are life members of the George Washington University General Alumni Association or the Alumni Association of any school of the University, or are current contributors to the George Washington University Fund.

All alumni are urged to keep the Alumni Office informed of changes of address or occupation and to supply information with regard to their fellow alumni. The Office is located in Alumni House, 714 21st St., N.W., George Washington University, Washington, D.C. 20052.

ENGLISH FOR INTERNATIONAL STUDENTS

Director G.R. Bozzini

This is a comprehensive program in English as a foreign language, designed to serve members of Washington's international community wishing either to enroll in University credit programs or to improve their command of English through an intensive or semi-intensive study program. In general, students must have completed the equivalent of an American college-preparatory high school education.

Courses are offered at various levels of proficiency covering both oral and written communication and are scheduled in 14-week sessions during the fall and spring semesters and for 10-week sessions during the summer. Students entering the program will take a battery of tests to determine their levels of proficiency for placement in English and academic programs. Registration for the tests is held in advance at the Office of

English for International Students, Parklane Building, Suite 317, 2025 Eye St., N.W., Washington, D.C. 20052. A $10 testing fee, payable in advance, is charged each student.

Persons writing from outside the United States and needing a student visa will be considered for I-20 certificate of eligibility for student visa validation. Those interested in applying for a degree program should see pages 25-26 for additional information.

STUDENT LIFE

Vice President for Student Affairs William Smith, Jr.
Assistant to the Vice President for Student Affairs John Perkins

The Office of the Vice President for Student Affairs develops student life services, policies, and procedures to complement the University's formal instruction program. These activities are implemented through the offices of the Cloyd Heck Marvin Center, Counseling Center, Dean of Students, Educational Opportunity Program, Housing, International Students, Services for Students with Disabilities, Student Activities, Student and Alumni Career Services and Student Health Service. The Office of the Vice President for Student Affairs is also responsible for programs and services for alumni through the Office of Alumni Relations.

OFFICE OF THE DEAN OF STUDENTS

Dean of Students Gail Short Hanson
Assistant Dean of Students Cheryl Beil

The Office of the Dean of Students provides counseling and information for students, and assists in program development for the Division of Student Affairs. Staff members are well-informed on University policies and the various student services provided on campus, enabling them to provide referrals and answers to many questions concerning general student life. Personal letters of recommendation for students applying to graduate and professional schools can be obtained from this office. The Dean of Students works with the Advisor to International Students, the Director of the Counseling Center, the Director of the Educational Opportunity Program, the Director of Services for Students with Disabilities, the Director of the Student Health Service, and the Director of the Student and Alumni Career Services Office in the implementation of their programs.

Counseling Center

Director E. Lakin Phillips
Assistant Director Patricia Zingheim

The Counseling Center works to enable students to overcome obstacles which hamper learning. The Center's services are offered to students and

staff, and include (1) resolution of the individual's educational, vocational, or personal conflicts through short-term individual or group counseling, vocational testing, or study skills remediation; (2) training of graduate students, resident assistants, and paraprofessionals; (3) consulting on mental health topics; and (4) development of new methods and programs to aid student growth, such as counseling through written communication, videotaped counselor skills training, and interpersonal skills workshops.

The Center administers the Miller Analogies Test, admissions testing, and special assessments for business and industry. Through its Office of Community Services, the Counseling Center also provides vocational counseling and educational programs to the greater Washington community.

Students may request a cost-free interview from 9 a.m. to 4:30 p.m., Monday through Thursday, and from 1 to 4:30 p.m. on Fridays. If the student decides to continue, a fee of $5 for full-time students ($15 for part-time students) per appointment will be charged for short-term treatment. If a test battery is called for, an additional $12 materials fee will be charged. However, if financial need is a factor, fee adjustments can be made.

The Counseling Center is located at 718 21st St., N.W.

International Student Advising Office

Director Patricia McMillen
Assistant Director Robert Locke

Located in the International House at 2129 G St., N.W., the staff of the International Student Advising Office provides advising and counseling in matters of personal and academic concern and visa regulations. This office is also a consultation, information, and resource center for the University's international population.

Educational Opportunity Program

Director Ronald Whitmore
Counselor Marquita Green

The Educational Opportunity Program is designed to provide selected District of Columbia high school graduates and other qualified District residents with financial and personal support as well as academic assistance to help them pursue degree work at George Washington University. The Program Office is located at 2127 G Street, N.W.

Services for Students with Disabilities

Director Linda Donnels

The Director of Services for Students with Disabilities works to ensure that the special services necessary for handicapped students to participate fully in their academic programs and the extra-curricular life of the campus are provided for them through University or community resources.

Student and Alumni Career Services Office

Director Gordon Gray
Assistant Director Cynthia Gurne
Counselors Barbara Fitzgerald-McClain, Paula Hoffman

The Career Services Office provides career guidance and placement to GW students and alumni. Some of the specific services are: full-time and part-time job vacancy lists, career counseling, programs on job-seeking skills, a full library of literature on occupations and employers, and current information on government employment including testing dates and application forms. Seniors and alumni may also use the office to establish credential files for application to graduate schools and for employment. The office is open from 9 a.m. to 5 p.m., Monday through Friday, with evening hours scheduled during each semester. It is located at Woodhull House 2033 G St., N.W.

Student Health Service

Director Mary Capon, M.D.

The Student Health Service is an outpatient clinic located in the H. B Burns Memorial Building at 935 22nd St., N.W.

Physicians and physician assistants are available by appointment from 9 a.m. to 4:45 p.m., Monday through Friday. In addition, physician assistants are available for primary care to walk-in patients Monday through Friday from 5 to 6:45 p.m., on Saturday from 9 a.m. to noon, and on Sunday from 10 a.m. to noon.

For serious emergencies occurring during hours when the Student Health Service is closed, students may go to the Emergency Room of the University Hospital for treatment. This arrangement is for emergency care only, and all fees are the responsibility of the student.

Students must be currently enrolled on campus in the University to receive treatment at the Student Health Service. Students who so desire may engage physicians and nurses of their own choice, but these students will be responsible for all fees charged. The bills incurred from all services rendered outside of the Student Health Service (for example, x-ray work, laboratory work, and referrals to specialists or other outside physicians) are the responsibility of the student.

HEALTH AND ACCIDENT INSURANCE

The Student Health Service has arranged for and endorsed group health and accident insurance, on an elective basis, for those students who do not have other coverage. Interested students should contact the Student Health Service or Office of the Dean of Students.

HOUSING

Director of Housing Ann Webster
Associate Director John Bohen
Assistant Directors Marilyn Mundy, Clay Nelson

Complete information concerning the University's residence halls is available from the Director of Housing, George Washington University, Washington, D.C. 20052. Information concerning off-campus housing near the University also may be obtained at this Office.

Admission to the University does not include a room reservation. The student will receive, with the notification of acceptance, University res-

dence hall information, an application for residence hall space, and a declaration of intent to attend the University. The application for residence hall space must be accompanied by a $100 *nonrefundable deposit*. The housing deposit is credited toward the first semester's room charge. Rooms are leased for the academic year, and lease payment must be made by June 15 for the fall semester.

1979-80 Residence Hall Rates Per Person for Two Semesters*

For Men:

Calhoun Hall	
double room	$1,300
triple room	1,240

For Women:

Strong Hall	
single room	1,356
double room	1,300
triple room	1,212

For Men and Women:

Crawford Hall (limited to sophomores, juniors, and seniors)—	
double room	1,300
Building JJ, Creative Arts (limited to sophomores, juniors, and seniors)—	
apartment for 4 or 6 persons	1,328
Francis Scott Key Hall (limited to juniors and seniors):	
apartment for two persons	1,386
apartment for three persons	1,386 or 1,328
Mitchell Hall (limited to sophomores, juniors, and seniors)—	
single room	1,386
Madison Hall	
double room	1,300
triple room	1,212
Thurston Hall	
double room, triple room, room for four	1,300
suite for six	1,212

Food Service

Resident freshmen and sophomores are required to participate in the food service plan. Freshmen must participate in the seven-day, 19 meals per week plan at the rate of $932† for the academic year. Sophomores may elect either the 19-meal plan or an any 14 meals per week plan for $876† for the academic year. Each plan, plus an additional any 10 meals per week plan at $756† for the academic year, is optional for junior, senior, and graduate students. Food service payment does not cover University intersession or vacation periods. All meal cards admit bearer to dining rooms in Thurston and Mitchell Halls and to the second-floor contract dining room

* Residence hall prices and allocation subject to change
† Food service prices subject to change.

in the Cloyd Heck Marvin Center. Meal cards may also be used on a cash equivalency basis in the Marvin Center first-floor cafeteria and Rathskeller.

Students who observe the Jewish dietary laws can write to make arrangements with the George Washington University Housing Office regarding the B'nai B'rith Hillel Foundation Kosher Meal Plan.

Munson Hall Apartments

Munson Hall is a University owned and operated apartment house containing 15 one-bedroom and 54 efficiency apartments. Full-time graduate and married students are eligible to reside in Munson Hall. Those wishing to apply for an apartment should contact the Housing Office for a waiting list application. All leases are for 12 months.

Milton and Guthridge Apartments

These apartment houses are University-owned, commercially operated buildings within the campus area. Each building contains efficiency and one-bedroom units which are rented only to full-time graduate students on an "as available" basis. Referrals to the resident managers of these buildings are made by the Director of Housing when notice is received of vacancies. Leases are executed with the respective management companies and are on a month-to-month basis.

CLOYD HECK MARVIN CENTER

Director Boris Bell
Assistant Director Donald Cotter

The Cloyd Heck Marvin Center serves as the campus community center, providing services, conveniences, and recreational and social opportunities for students, faculty, staff, alumni, and guests. Its wide range of facilities provides the setting for a variety of programs conducted by the University Program Board; by the departments of drama, dance, and music; and by other student and faculty organizations.

The Center Governing Board, representative of all segments of the University community, plays an important role in the day-to-day functioning of the Center. This Board works closely with the full-time staff in the development of procedures and policies which provide a framework for the Center's operation.

STUDENT ACTIVITIES OFFICE

Assistant Directors Claudia Derricotte, Gary Salussolia

The Student Activities Office assists individual students and organizations in program development, campus leadership development, and participation in special projects, both within the University community and the community at large. The Office serves as a clearinghouse for activities information, registers and advises student organizations, and informs the University community of activities and programs through monthly and annua

publications. The Student Activities Office is also responsible for coordinating the orientation program for new students, and for planning supplemental development programs for graduate and undergraduate students. Students who want to participate in the extracurricular phases of University life should acquaint themselves with the facilities and staff of the Student Activities Office.

UNIVERSITY COMMITTEES AND ORGANIZATIONS

Student involvement is a motivating force in the governance of the University through the committee structure. This involvement has helped develop policies and programs beneficial to the student population and to the total University community. The numerous committees on which students may serve are described in the *Student Handbook*, which is available in the Student Activities Office.

Student Government

The George Washington University Student Association (GWUSA) is comprised of all full-time and part-time graduate, professional, and undergraduate students who are registered for academic credit on campus. A body of elected and appointed individuals is responsible for representing the interests of students at the University. Further information can be obtained from the Student Government offices in the Marvin Center.

Student Organizations

Students are encouraged to become involved with existing student organizations or to initiate their own. The *Student Handbook*, available in the Student Activities Office, lists approximately 150 organizations under the following categories: Academic; Professional; Honorary; International, Cultural; Political Interest; Service; Special Interest; Sports, Hobbies and Recreation; Religious and Meditative; and Social Fraternities and Sororities. More complete information about these organizations can be obtained through the Student Activities Office.

RELIGIOUS LIFE

The University recognizes the contribution that religion makes to the life of its students and encourages them to participate in the various religious organizations of their own choice. Catholic, Jewish, and Protestant bodies sponsor various groups and form a link between the University and the religious community. The advisers of the religious organizations are available for counseling.

Religious services in various traditions are provided regularly for the University community as announced.

MAJOR PROGRAM EVENTS

Art Exhibits—The work of locally, nationally, and internationally known artists is shown in monthly exhibits in the Dimock Gallery in Lisner Audi-

torium and in the art gallery of the Cloyd Heck Marvin Center. With the cooperation of the Curator of Art, an annual student art exhibit is presented.

Concert Series—The Department of Music presents a series of concerts featuring faculty, guest, and student artists throughout each year.

Dance—The GWU Dance Company presents major concerts, informal studio performances, experimental events, television appearances, and lecture-demonstrations. Students may audition to become company members and have the opportunity to choreograph, perform, and gain experience in the technical aspects of dance productions.

International Programs—The International Student Society presents an annual International Dinner in cooperation with foreign embassies and international restaurants. Other programs include regular forums and speakers on international topics.

Orchestra and Chorus Concert Series—The University Orchestra and Chorus are two facets of the lively arts available to students either as credit courses or as extracurricular activities. The Chorus presents major performances to the University community three or four times a year, including regular winter and spring concerts. The University Orchestra presents several performances annually.

Program Board Series—The University Program Board regularly sponsors social activities, films, lectures, and special events.

Recreation Program—The new Charles E. Smith Center for Physical Education and Athletics offers many facilities for student use. The University Recreation Association and the Department of Human Kinetics and Leisure Studies arrange a wide variety of sports and recreational activities and special events for all students.

Theater—The University Theater produces four or five major plays and musicals during the year on the proscenium/thrust stage in the Dorothy Betts Marvin Theatre or in Lisner Auditorium. Additional works, including original and experimental plays, are produced in a more intimate studio theater. Students have the opportunity to participate in all aspects of theater and may receive credit toward their B.A. or M.F.A. degrees for some of their production work.

ATHLETICS AND INTRAMURAL SPORTS

The University is a member of the National Collegiate Athletic Association, the Eastern College Athletic Conference, the Association for Intercollegiate Athletics for Women and the Eastern Association of Intercollegiate Athletics for Women. Its teams participate against major universities throughout the Midwest and Eastern Seaboard. The intercollegiate programs for men and women offer such sports as basketball, baseball, soccer, tennis, golf, wrestling, crew, swimming and diving, squash, badminton, volleyball, and gymnastics.

The University offers a broad program of intramural sports activities for both men and women.



COLUMBIAN COLLEGE OF ARTS AND SCIENCES

Dean C.D. Linton
Assistant Deans B.J. Dunham, R.E. Knowlton, J.L. Métivier, Jr., R.C. Rutledge

FACULTY*

Professors E. Abravanel, J.G. Allee, Jr., J. Aschheim, D.L. Atkins, R.L.A. Bari, O. Bergmann, L.S. Bielski, L.S. Bowling, H.F. Bright, A.D. Britt, R.G. Brown, J.F. Burks, W.E. Caldwell, E.A. Caress, G.V. Carroll, I.H. Cisin, A.G. Coates, J. Cornfield, T.F. Courtless, Jr., R.H. Davison, L.G. DePauw, R.M. Dunn, Jr., J. Eisenstein, N. Filipescu, J.A. Frey, R.N. Ganz, Jr., J.L. Gastwirth, M. Gordon, S.W. Greenhouse, F.S. Grubar, A. Gyorgy, S.E. Haber, M. Halperin *(Research)*, R.C. Haskett, P.H. Highfill, Jr., P.P. Hill, J.W. Hillis, H.C. Hinton, H.H. Hobbs, M.A. Holman, C. Hsieh, R.L. Humphrey, Jr., R.G. Jones, H.D. Junghenn, I. Katz, J.W. Kendrick, R.W. Kenny, H. Kenyon, Y. Kim, J.C. King, A.D. Kirsch, P.F. Klarén, D. Krueger *(Research)*, R.M. Krulfeld, C.J. Lange, I.Z. Lavine, H.L. LeBlanc, P.H.M. Lengermann, S. Levitan, B.I. Levy, J.B. Levy, J.F. Lewis, R.K. Lewis, H.W. Lillhefors, R.C. Lindholm, C.D. Linton, T.P.G. Liverman, W.F.E. Long, J.C. Lowe, N. Mantel *(Research)*, G.E. Mazzeo, J.L. Métivier, Jr., J. Miller, C.C. Mondale, J.A. Morgan, Jr., J.N. Mosel, C.A. Moser, N.N. Natov, D. Nelson, B. Nimer, R. Parris, T.P. Perros, E.L. Phillips, F. Prats, R.E. Purcell, J.P. Reesing, Jr., B. Reich, W.M. Reynolds, C.E. Rice, J.W. Robb, H.M. Sachar, B.M. Sapin, S.O. Schiff, R.H. Schlagel, W.E. Schmidt, L.G. Schwoerer, R.P. Sharkey, L. Shaw *(Research)*, C. Shih, R.H. Shumway, F.R. Siegel, D.E. Silber, N.D. Singpurwalla *(Research)*, H. Solomon, C. Steiner, G. Steiner, R.W. Stephens, C.T. Stewart, Jr., T. Suranyi-Unger, Jr. *(Research)*, C. Taam, D.H. Teller, K. Thoenelt, R.B. Thompson, R. Thornton, C.M. Turnbull *(Visiting)*, R.C. Vincent, R.D. Walk, R.H. Walker, Jr., D. Wallace, Jr., R.A. Wallace, E.R. Weismiller, D.G. White, R.E. Wood, H.B. Yakobson, H.E. Yeide, Jr., A.J. Zuchelli

Adjunct Professors T.E. Bowman, J.C. Broderick, M.A. Buzas, R.F. Caron, T.F. Carroll, F.A. Chace, Jr., J.L. Fisher, J. Grunwald, M.L. Jones, E.G. Kauffman, L.S. Kornicker, W.H. Lewis, R. Manning, J.B. Margolin, C.G. McWright, R.P. Multhauf, J.W. Pierce, H.A. Rehder, I.G. Sohn, P. Swamy

Associate Professors A.D. Andrews, S.R. Barnett, J.R. Barth, G.R. Bozzini, L. Brandt, M.D.M. Brewer, A.E. Claeyssens, Jr., M.A.B. Coffland, R.L. Cole, C.F. Elliott, R.S. French, H.I. Gates, H.F. Gillette, Jr., I.I. Glick, R.S. Goldfarb, V.K. Golla, M.D. Green, W.B. Griffith, R.A. Hadley, J. Helmer, D.R.K. Henney, C.J. Herber, A.J. Hiltebeitel, R.W. Holmstrom, J.O. Horton, T.L. Hufford, C.T. Ireland, W.R. Johnson, S.A. Karp, R.E. Kennedy, Jr., M.S. Kernan *(Visiting)*, N.K. Khatcheressian, M. King, R.E. Knowlton, J.M. Lachin III *(Research)*, J.L. Lake, M.P. Lee, D.R. Lehman, C.A.

* The President of the University, the Vice President for Academic Affairs, the Registrar of the University, the Director of Admissions of the University and the University Librarian are ex officio members of the Faculty of Columbian College of Arts and Sciences.

Linden, C.W. Lineburgh, J.M. Loesdon, G. Ludlow, J.H. Maddox, H. Merchant, B.M. Mergen, H.R. Nau, G.A. Olkhovsky, R.K. Packer, W.C. Parke, E.O. Pederson, J.A.A. Plotz, P.J. Poppen, J.A. Quitslund, D.E. Ramaker, J.R. Regnell, P. Robbins, L.F. Robinson, L.A. Rothblat, W.W. Rowe, D.A. Rowley, R.C. Rutledge, P.G. Sáenz, R.M. Scheffler, S.L. Simons, W.A. Smith, C.W. Sten, P.L. Stewart, E.A. Stone, R.H. Tanck *(Research)*, M.F. Taragin, R.E. Thomas, I. Thompson, N.A. Tilkens, J.L. Tropea, C.E. Tuthill, S.J. Wayne, R.C. Willson, J.F. Wright, Jr., A.M. Yezer, R.Y. Yin, J.E. Ziolkowski

Adjunct Associate Professors G. Evans, C. Field, W.D. Hope, D.G. Kleiman, L.J. Lear, A.L. Nelson, D.L. Pawson, J.N. Pearce, M. Rice, C.F. Roper, J. Rosewater, F. Schmidt, G. Wisan

Assistant Professors C.M. Alu, D.A. Altshuler, J.C. Anderson, I. Azar, M.E. Boeckmann, A.S. Brooks, A.R. Bruhn, G. Carter, R.P. Churchill, R.L. Combs, J.J. Cordes, C.C. Costigan, J.P. Dirkse III, R.P. Donaldson, R.K. Evans *(Visiting)*, D. Fischer, A.K. Fitzsimmons, N.C. Garner, S.K. Green, E. Griffith, E.P. Harper *(Visiting)*, S. Hashtroudi, J.R. Henig, J.E. Hicks, D.M. Hitchcock, G.P. Huvé, L.B. Jacobson, D.E. Johnson, S. Keller, M.P. Lader, D.L. Lee, D.L. Lindauer, D. McAleavey, C. McClintock, A.L. Meacher, M.R. Metzger, S.B. Mollins, S.N. Nafici, T. Ozdogan, G. Paster, J.R. Peverley *(Visiting)*, D. Pollock *(Visiting)*, S.A. Quesnel, L.P. Ribetto, B.W. Sabelli, O.A. Seavey, R.P. Seifert, S. Shaffer, R.C. Sickles, R. Sines, A.H. Smith, M.J. Sodaro *(Visiting)*, A.D. Strickland, J.M. Thomas, J.L. Thiel, B. Von Burghahn, A.G. Wade, G.C.Y. Wang, S.L. Wolchik *(Visiting)*, W.T. Woodward

Adjunct Assistant Professors M.S. Cruz-Sáenz, E.A. Fisher, C.H. Greer, R.J. Guenther, M.M. Gupta, J.K. Kern, M.F. Miller, B.K. Netland, P.M. Palmer, L.S. Pena, F.C. Reid, C.R. Rose, G.C. Stephens, M.C. Tolson, C.A. Wagner, E.E. Williams, E.R. Zeitz, A.M. Zwick

Instructors S.J. Carroll, T.A. Farrand, E.A. Peterson

Committees*

DEAN'S COUNCIL FOR FRESHMAN AND SOPHOMORE AFFAIRS

1979: R.C. Lindholm, W.C. Parke
1980: J.F. Burks, T.F. Courtless
1981: M.D.M. Brewer, D.E. Silber

DEAN'S COUNCIL FOR JUNIOR AND SENIOR AFFAIRS

1979: R.L. Cole, A.M. Yezer
1980: R.L. Combs, R.K. Packer
1981: A.D. Kirsch, J.R. Regnell

COMMITTEE ON ADMISSION AND ADVANCED STANDING

T.P. Perros *(Chairman)*, M.D. Green, R. Hadley, J.L. Métivier, Jr., C.E. Rice, L.F. Robinson, R. Walker

* The Dean of Columbian College is an *ex officio* member of all committees; all listed committee members are elected by the Faculty of Columbian College.

COMMITTEE ON SCHOLARSHIP

R.E. Knowlton, *(Chairman)*, B.J. Dunham, J.A. Frey, C.J. Herber, M. King, R.M. Krulfeld, C.E. Mazzeo, J.L. Metivier, Jr., J.A. Morgan, Jr., R.C. Rutledge, S.O. Schiff, R.A. Wallace

COMMITTEE ON STUDENT ADVISING

B.J. Dunham *(Chairman)*, J. Aschheim, D.L. Combs, R.E. Knowlton, G. Ludlow, D.E. Pollock, S.A. Quitslund, R.C. Rutledge, W.E. Schmidt, W.A. Smith, E.A. Stone, K. Thoenelt, H.E. Yeide, Jr.

COMMITTEE ON USE OF CORRECT ENGLISH

A.E. Claeyssens, Jr. *(Chairman)*, J.G. Allee, Jr., R.G. Jones, M. Strom, R.C. Willson

COMMITTEE ON CURRICULUM

1979: A.E. Claeyssens, Jr., J.A. Frey, H.H. Hobbs, M. Gordon
1980: R.W. Kenny, B. Reich, W.E. Schmidt, R.H. Shumway
1981: T.L. Hufford, P.H.M. Lengermann, C.A. Moser, W.M. Reynolds

SUPERVISORY COMMITTEE ON DEGREES ADMINISTERED BY THE COLLEGE OF GENERAL STUDIES

R.C. Rutledge *(Chairman)*, D.L. Atkins, F.S. Grubar, C.J. Herber, M.A. Holman, D. Nelson, D.G. White

Council of Arts and Sciences*

CHAIRMAN

Mark Sullivan, Jr. *(University Trustee), Thomson & McKinnon Auchincloss Inc., Washington, D.C.*

MEMBERS OF THE COUNCIL

Windsor P. Booth, *Chief of the News Service, National Geographic Society*
Waldron Faulkner, *Faulkner, Stenhouse, Fryer & Faulkner, Washington, D.C.*
David Edward Finley *(Retired Director of the National Gallery of Art), Washington, D.C.*
Robert R. Garvey, Jr., *Executive Secretary, Advisory Council on Historic Preservation, Washington, D.C.*
Patrick Hayes, *Managing Director of the Washington Performing Arts Society, Washington, D.C.*
Jean Ross Howard, *Office of Public Affairs, Aerospace Industries, Washington, D.C.*
Jeremiah Milbank, Jr. *(University Trustee), New York, N.Y.*
John Palmer Reesing, Jr., *Professor of English*
Sidney Dillon Ripley II *(University Trustee), Secretary, Smithsonian Institution*

* This Council serves both Columbian College of Arts and Sciences and the Graduate School of Arts and Sciences. The President of the University, the Vice President for Academic Affairs, the Dean of Columbian College of Arts and Sciences, and the Dean of the Graduate School of Arts and Sciences are ex officio members of the Council.

Robert Poindexter Sharkey, *Professor of Economic History*
Julian H. Singman, Attorney, Washington, D.C.
Louis B. Wright, formerly *Director, Folger Shakespeare Library*

INTRODUCTION

Since its founding in 1821, Columbian College of Arts and Sciences, the liberal arts college of the University, has continued to expand and develop with the city of Washington. Its central situation makes participation in the life of the nation's capital convenient for resident students. The cosmopolitan nature of the student body reflects the atmosphere of a great world capital. Because the students come from the 50 states and from 120 foreign countries, class discussions and casual student conversations are enriched by a challenging variety of viewpoints.

The Columbian College program is a contemporary application of the historic liberal arts tradition. Its purpose is to enable the student to develop both particular abilities and general awareness as a human being. It demands of the student a thorough acquaintance with one major area of learning and at the same time an understanding of how that specialization fits into the larger context of the scientific, social, and moral problems which confront modern society. It stresses a broadly enlightened perspective which encourages its graduates to grow through the years in ability and wisdom.

Throughout its history, the College has kept pace with, and often led, movements of reform in higher education. Sensitive to the rapidly changing patterns of student and social needs, notably the increasing maturity and knowledge of the modern incoming freshman, the College has from time to time inaugurated major changes in its academic programs. In brief summary, present patterns are designed to (1) permit the able student to earn the baccalaureate degree in less than the standard four years, either by earning credit through a wide variety of examinations or by performing with excellence within a 90-semester-hour three-year program; (2) provide each student with a greater opportunity to design an individual academic program by eliminating almost all specific course requirements except in the major field; (3) encourage an early and close association between the student and individual faculty members in the field of the student's chief interest; and (4) foster a spirit of community and shared responsibility between faculty and student.

Opportunities exist for double majors within the College; interdisciplinary programs; and, in the case of the student who finds no existing major or program suitable to individual educational goals, special interdisciplinary programs which may be developed by the student, in consultation with departmental advisors and with the final approval of the Committee on Curriculum.

Columbian College offers programs leading to the degrees of Associate in Arts, Bachelor of Arts, and Bachelor of Science; prelegal and premedical programs; and the first two years of the professional programs in public and international affairs.

Columbian College has degree-granting authority over certain programs which combine on-campus and off-campus courses. These include the Bachelor of Science degrees in Geodesy, Cartographic Science, and Oceanography. As most of the courses in the first two years of these programs

are offered on campus, students may be admitted as full-time on-campus students in Columbian College. After the first 64 hours, most of the courses are offered at off-campus locations. Students are then required to register for their course work with the College of General Studies, which administers off-campus programs. Students attending off-campus classes are expected to provide their own transportation to and from class. Distances involved vary from two to 20 miles from the campus area. Columbian College also has degree-granting authority over two other programs which are usually offered off campus and administered by the College of General Studies: Associate in Arts in General Studies and Bachelor of General Studies (areas of concentration in economics, history, mathematics, political science, psychology, and sociology). For further information on all these programs, see the *College of General Studies Bulletin*.

ENTRANCE REQUIREMENTS

Good character and an academic background appropriate for the program of studies contemplated are required.

Requirements for admission to the freshman class are as follows:

1. An acceptable certificate of graduation from an accredited secondary school, showing at least 15 units* which must include four years of English; at least two years of one foreign language; two years of science, preferably with laboratory instruction; two years of social studies, one of which must be American history; and one year of college preparatory mathematics beyond introductory algebra.
2. The principal's statement that the applicant is prepared to undertake college work.
3. College Entrance Examination Board scores submitted on the Scholastic Aptitude Test and the English Composition Achievement Test.

It is recommended that the examinations be taken in December or January. Scores on tests taken in the junior year may be submitted. Arrangements for tests are the responsibility of the applicant and should be made with the Educational Testing Service, Princeton, N.J. 08540; or 1947 Center Street, Berkeley, Calif. 94704, not less than one month before the date of the test. In applying for the test, the applicant should specify that the scores be sent to the Office of Admissions, George Washington University, Washington, D.C. 20052.

The College Entrance Examination Board tests are preferred; however, the American College Testing battery scores will be accepted. The applicant should request that these scores be sent to the Office of Admissions directly from the American College Testing Program, Iowa City, Iowa. It is recommended that the applicant take the tests in October of the senior year.

The Committee on Admission and Advanced Standing will consider the adequacy of the qualifications of an applicant who, because of unusual circumstances, does not present all of the formal requirements stated here. The Committee may prescribe appropriate scholastic-aptitude tests of the University. Students admitted with deficiencies in secondary school

* A unit represents a year's study in a secondary school subject, including in the aggregate not less than 120 sixty-minute periods, or the equivalent, of prepared classroom work.

units will be required to begin removing such deficiencies within the first year, by appropriate courses or examinations. Courses taken to clear entrance deficiencies will not fulfill Columbian College meaningful initiation requirements as set forth on pages 72-73.

REGULATIONS

Regulations regarding admission, registration, fees and finances are stated on pages 20-32; other University regulations, on pages 44-52.

SCHOLARSHIP REQUIREMENTS

ACADEMIC WORK LOAD

To encourage academic performance of high quality, the student's work load is limited.

A full-time student not on probation may take a course load of as much as 17 semester hours. A student employed more than 20 hours a week who is not on probation may take not more than 10 hours.

The amount of work taken by a student on probation may be limited by the Committee on Scholarship.

A full-time student who, during the immediately preceding semester, has received no grades below *B* and has earned grades of *A* in three courses totaling at least nine semester hours may take 18 or 19 hours. An employed student who, during the immediately preceding semester, has received no grades below *B* and has earned grades of *A* in two courses totaling at least six semester hours may take 12 hours.

A student who accepts employment after registration or at any time during a semester must report that fact immediately to the dean so that the academic program may be adjusted, if necessary.

ATTENDANCE

The student is held responsible for all the work of the course in which registered, and all absences must be excused by the instructor in charge before provision is made for the student to make up work missed.

ADDING AND DROPPING COURSES

After registering, a student may add or drop courses only by means of an official "drop-add" form available in the Office of Columbian College. Failure to drop a course may result in a failing grade. The deadline for adding a course during the regular fall or spring semesters is the end of the first week of classes. However, if the student presents a note from the instructor explaining the special circumstances, and granting permission, a course may be added up to the end of the second week of classes.

The deadline for dropping a course without academic penalty is the end of the fourth week of classes in the fall and spring semesters. The deadline for complete withdrawal from all courses without academic penalty is the end of the ninth week of classes. After the deadlines, program changes require that the student present a petition to the Dean's Council.

USE OF CORRECT ENGLISH

The use of correct English, oral and written, is required in all courses. Any student whose English in any course whatever is deemed unsatisfactory may be reported by the instructor to the dean and to the Committee on the Use of Correct English. The chairman of the Committee may assign supplementary work, without academic credit, varying in amount with the needs of the student. If the work prescribed is equivalent to a course, the regular tuition fee is charged. The granting of a degree may be delayed by failure to make up any such deficiency in English to the satisfaction of the Committee and the dean.

DEAN'S LIST

The name of every student who takes a minimum of 15 semester hours (none of which may be in credit/no credit courses) in any one semester, who receives grades of *A* in at least 60 per cent of the course work taken in that semester, and who has no grades below *B* for that semester, is placed on the Dean's List for that semester.

ACADEMIC STANDING

A student who is not suspended or on probation is considered to be in good standing.

The following rules governing probation and suspension are applicable as stated to students enrolled for a full-time program (12 semester hours or more) during the fall or spring semester. Students enrolled for less than 12 semester hours during the fall or spring semester and students enrolled during the summer sessions are subject to probation or suspension on the basis of their record for four courses (three or more semester hours of credit each), or multiples thereof, rather than on their record in any one semester.

Probation—A student who in one semester receives two grades of *F* in courses carrying three or more semester hours of credit each or the equivalent, is placed on probation. A student in the first semester on probation who receives one grade of *F* in such a course will be continued on probation for a second semester. Two grades of *D* will be treated as equivalent to one grade of *F* in determining probation. Any grades of *D* or *F* replacing earlier grades of *I* will be considered a part of the record for the semester during which the *I* is removed. A student on probation taking 12 or more semester hours whose grades are all *C* or better is removed from probation.

Suspension—The following cases constitute grounds for suspension: (1) three grades of *F* in courses carrying three or more semester hours of credit, or the equivalent, in one semester; (2) two grades of *F* in such courses in the first semester on probation; (3) one grade of *F* in such courses in any later semester on probation. Two grades of *D* will be treated as equivalent to one grade of *F* in determining suspension. Any grades of *D* or *F* replacing earlier grades of *I* will be considered a part of the record for the semester during which the *I* is removed.

The minimum period of academic suspension is one fall or one spring

semester. Final dates for applying for readmission are the same as those governing undergraduate admission (see page 20). A suspended student seeking readmission must submit evidence to the Committee on Admission and Advanced Standing of conduct during absence from the University which indicates that the student will profit from readmission. A student suspended twice for poor scholarship will not be readmitted.

Mid-semester Warning—When, at the end of the sixth week of each semester, instructors file in the Office of the Dean the names of freshman and sophomore students who are doing unsatisfactory work, a notice of warning is sent to the student and a copy filed with the appropriate advisor. A warning constitutes notice to the student to consult the instructor and advisor at the earliest opportunity.

INCOMPLETE/AUTHORIZED WITHDRAWAL

Conditions under which the grades of *I* (Incomplete) or W (Authorized Withdrawal) may be assigned are described on page 45.

Removing an Incomplete—The grade of *I* must be removed no later than the last day of the examination period for the fall or spring semester immediately following the semester or summer session in which the grade of *I* is assigned. An "incomplete" that is not removed within this period is automatically changed to an *F*. In cases of well-documented extenuating circumstances, an instructor and a student may jointly petition the dean, or the appropriate committee, for additional time in which to complete the work of the course. Such petitions should be submitted within the same period. The grade of *I* cannot be removed by reregistering for the course here, or by taking its equivalent elsewhere

CORRESPONDENCE AND HOME-STUDY COURSES

No credit is given for work done by correspondence or in home-study courses.

CLASSIFICATION OF STUDENTS

A student becomes a *sophomore* upon completion of 30 semester hours, a *junior* upon completion of 60 semester hours, and a *senior* upon completion of 90 semester hours.

An *unclassified student* is one who is not a candidate for a bachelor's degree normally because the student already holds one, but who wishes for valid academic reason to take a limited program for a limited time. Registration in this status is permitted only with the prior approval of the appropriate Dean's Council.

SOPHOMORE YEAR IN PARIS PROGRAM

Freshmen who have received grades of C or higher in all course work during the first semester may be eligible to participate in the George

Washington University-American College in Paris Sophomore Year Program. Qualified students will be encouraged to accept this opportunity to profit from the cultural and intellectual riches of Europe by spending their second year living and studying in Paris. Credits earned in this program will be transferable toward a degree in Columbian College of Arts and Sciences. Since all courses are taught in English, a knowledge of French is not mandatory, but is desirable. More information may be secured from Assistant Dean J.L. Métivier at the Office of Columbian College.

INACTIVE STATUS

Students in Columbian College who wish to interrupt their studies may apply to the dean for Inactive Status. They may apply at any time before the close of the registration period of the first semester for which this status is desired. If approved, Inactive Status (for which no fee is charged) assures the student for a period of one calendar year that re-entrance to the College may take place under regulations prevailing at the time of last registration. After the expiration of one calendar year of Inactive Status, *or if the student has attended any other college or university during absence from this University* (but see below), the student must follow regular readmission procedures and resume studies, if readmitted, under regulations then current.

Students who wish to attend another college or university, in this country or abroad, during the period of Inactive Status may, by prior petition to the dean, request approval of the planned program and, if approval is given, be assured of re-entry within one year under regulations prevailing at the time of last registration here.

ADVISORY SYSTEM

Each student is provided with both academic advising and personal counseling. *Academic advising is performed by members of the faculty selected for their knowledge of academic programs, and each student, before registration, makes up a program in consultation with the advisor assigned.* A student who has *not* selected a major field receives academic advising from a member of the Columbian College Committee on Student Advising (see page 69). A student who has officially declared a major field receives academic advising from the appropriate department, or from an interdepartmental committee. *Personal counseling is available through the Office of the Dean of Students or through the University Counseling Center.* All students are encouraged to maintain close contact with their advisors.

Students who intend to transfer after the sophomore year to the School of Public and International Affairs are assigned special advisors to assist them in planning their programs.

An academic warning system permits early attention to students whose work falls below required standards. In such cases, students are asked to consult regularly with their advisors. On request, and with the student's permission, copies of academic warnings or probation notices may be sent to parents or guardians, who are themselves welcome to meet with members of the advisory staff.

ACADEMIC ADVISING CENTERS

Each department has set up Academic Advising Centers where both general educational counseling and specific major-field advising are available to students. The locations and hours of these Centers may be obtained from departmental offices.

As the freshman student deliberates choice of a major, he or she should consult with faculty advisors in as many of these Centers as he or she wishes. Once a major is officially declared, the student then receives all academic counseling from the Academic Advising Center of the major department.

PEER ADVISING

To supplement academic advising by faculty members in Columbian College, peer advising is also available. During fall and spring registration, undergraduate peer advisors are centrally located to offer scheduling help and course selection advice to fellow students.

DECLARATION OF MAJOR

The student is encouraged to select and officially declare a major field early, normally no later than the end of the freshman year. All students, however, whether they are entering freshmen or transfer students, must secure the advisor's signature on a proper form (obtainable in the Office of Columbian College), and return the form to the Office of Columbian College in order to declare a major. No student is considered to have a major until this process is completed. Thereafter, the student receives academic guidance from a faculty advisor in the major-field department.

COLUMBIAN COLLEGE GENERAL COURSE REQUIREMENTS

All candidates for the degree of Bachelor of Arts or Bachelor of Science are admitted to a general arts and sciences curriculum until they declare a major field. Except for two general course requirements, all curriculum requirements leading to the degrees of Bachelor of Arts and Bachelor of Science are established by the various major field departments or programs.

The two general requirements are the following:

1. Each student must, during the freshman year, demonstrate adequate achievement in English Composition, either by examination or by taking Engl 9 or 10, and Engl 11 or 12. This requirement may not be postponed.

2. Each student at some point in the college career must undertake a meaningful initiation into the three divisions of knowledge: humanities, natural and mathematical sciences, and social sciences. As each major field will normally represent one of these three areas, the requirement may be fulfilled by taking no less than six semester hours in each of the other two areas. These six credits may be in approved introductory courses, or in approved advanced courses if the student is qualified and receives the instructor's permission. Courses taken to clear entrance deficiencies do not

satisfy meaningful initiation requirements. Applied and tool courses do not satisfy the requirement for meaningful initiation into the humanities. All science courses taken in fulfillment of the meaningful initiation requirement must include laboratory instruction. Normally, these six-hour units must be taken in a single subject or department. Courses simply waived (no credit assigned) cannot satisfy the meaningful initiation requirements.

It is recommended that courses taken to satisfy the meaningful initiation requirement be selected from the following:

Humanities

Art 31-32, 71-72. Classical languages 71, 72, 108, 113; Chinese 163-164, English 51-52, 61-62, 71-72, 191-192; French 51-52, 60, 91-92; German 51-52, 103-104, Music 3–4. Philosophy 50 and 71, 111, 112, 113, 131, 132, 151, 152, 162, or 172. Religion 9-10, 59-60, 21-22, or 23 and 9. Slavic languages 71, 91-92; Spanish 51-52, 91-92. Speech and Drama 45, 49, 133, 143, 144, 165, 166, 192.

Natural and Mathematical Sciences

Biology 3-4, 11-12; Chemistry 3-4, 11-12. Geology 1-2, or 5 and 2. Mathematics 51-52, 52-53, 11-42, 51-52, 53-54, 9-10, or any combination of two upper-level math courses. Physics 1-2, 9-10. Statistics 51 and 97 or 103, 53 and 97 or 105, 91 and 97, or 111-112.

Social Sciences

American Civilization 71-72; Anthropology 1-2. Economics 1-2. Geography 51-52. History 71-72, 39-40, 72 and 91, 40 and 91. Journalism 71-72, 111 and 115. Political Science 1-2; Psychology 1 and 5, 6, 8, 22, or 29. Sociology 1-2.

The following courses will not satisfy the meaningful initiation requirement: Applied courses in art (also Art 1), applied courses in music, and speech and drama (SpDr 1 and 11)
English composition courses
Basic (first- and second-year) foreign language courses
Mathematics 3, 6, 30

Required Placement Examinations

English—Students whose College Board English Composition Achievement Test scores suggest that they will benefit from more intensive training in compositional skills may be assigned to Engl 9 or may be tested in vocabulary, spelling, grammar, standard usage, and writing skill before placement in either Engl 9 or 10. Students whose scores indicate superior competence will be allowed to waive the Engl 10 requirement. Those whose scores indicate markedly superior competence will be allowed to waive both Engl 10 and Engl 11 or 12.

Note: A diagnostic test in reading proficiency is required for students enrolled in Engl 9. For those whose test results show a reading deficiency, a non-credit reading course—given by the Reading Center—is required. The reading course meets three hours a week for a maximum of 10 weeks.

Foreign Languages—A student who has not been granted advanced standing and who wishes to continue in college the language begun in high school must take a placement examination in one of the following: Chinese, French, German, Greek, Hebrew, Italian, Latin, Russian, or Spanish.

Upon completion of the examination, assignment is made to the appropriate course.

Mathematics—New students who wish to register in Math 30, 31, or 41 are required, prior to registration, to take a placement examination in algebra and trigonometry; those wishing to register in Math 51 or 53 are required, prior to registration, to take a placement examination in algebra.

Foreign Language Requirement

In most major programs requiring foreign languages a student must complete satisfactorily the equivalent of two years of college work in a single foreign language.

A student offering for admission four acceptable high school units of a single foreign language, or the equivalent, is not required to take any foreign language.

A student who offers less than four units and wishes to continue the same language must take the language placement test.

In many instances foreign languages are required or recommended as preparation for advanced work. The student should consult the advisor so that appropriate foreign languages may be included, when necessary, in the student's program.

First- and Second-Group Courses

First-group courses, those numbered from 1 to 100, are intended primarily for freshmen and sophomores. Second-group courses, those numbered from 101 to 200, are intended for juniors and seniors. However, a qualified freshman or sophomore may, with the permission of the advisor and of the department concerned, take second-group courses. Such qualification is achieved by passing or waiving introductory courses or prerequisite courses in the first group.

Courses in the Major Field or Department

Every student is given the opportunity of taking a wide range of liberal arts subjects—humanities, natural and mathematical sciences, social sciences—both as a means of laying the groundwork for more concentrated major-field study and as a means of determining what academic area is best adapted to the student's interests and aptitudes. In order to enhance this opportunity and to avoid over-specialization once a major has been selected, the student must take at least 60 hours of course work including the general course requirements of Columbian College, outside the major-field department or major program. (This does not apply to students in the 90-hour degree program.)

Professional Courses

Except for majors in applied mathematics and for students intending to apply for the combined degree of Bachelor of Arts and Doctor of Medicine, no more than 12 hours of professional courses, e.g., courses offered in units of the University other than Columbian College, may be included in the hours required for the bachelor's degrees in Columbian College. Students electing professional courses under this rule must obtain the approval of the dean before registration.

Human Kinetics and Leisure Studies

Courses in Human Kinetics and Leisure Studies are not required, nor are such courses generally acceptable for credit toward a degree. Upon prior petition to the dean, however, certain courses in dance as an art form may be included in the 12 hours of professional credit permitted.

Experimental Humanities/Service-Learning Program

A maximum of 21 semester hours in any combination of Experimental Humanities courses and Service-Learning Program courses may be credited toward bachelor's degrees in Columbian College.

Earning Credit By Examination

Assuming there is no duplication of coursework earned, a maximum of 30 semester hours of credit may be assigned for any combination of the following:

College Entrance Examination Board Advanced Placement Tests—Credit may be granted for college-level courses taken in an approved secondary school if substantiated by satisfactory performance on the Advanced Placement Tests. See pages 23-24 for further details.

College Entrance Examination Board College-Level Examination Program (CLEP)—Prior to matriculation, credit may be assigned for CLEP General Examinations passed at the 50th percentile or above. Credit may be assigned for any CLEP Subject Examinations passed at the level recommended in the College Board model policy. A few examinations in both categories, however, are unacceptable for credit. See page 23 for specific exceptions.

After matriculation, credit for CLEP Subject Examinations will not be assigned without special authorization by the Columbian College department governing the subject involved. See pages 22-23 for additional information.

Special Departmental Examinations—A student may request any department of Columbian College to offer a special examination covering the subject matter of any specific course. (If an appropriate CLEP Subject Examination is available, the department may choose to employ it.) Approval of such a request is not automatically granted: the student must offer evidence of sufficient background to have a reasonable command of the subject matter. A student who has previously taken examinations to waive course requirements may not subsequently take examinations for credit in the same courses. Assigning credit (or waiving a requirement) by special departmental examinations will depend on the department's evaluation of the examination paper. These examinations will normally be of at least three hours' duration. A fee of $25 for each course examination is charged for preparation, administration, and grading of the examination.

Waiving Introductory Courses by Examination

Placement Tests—Many departments in Columbian College, including English, mathematics and all foreign languages, require students to take placement tests to determine level of proficiency or eligibility for specified

courses. The student is placed in an appropriate course on the basis of these tests. There is no charge to the student for placement tests, and no credit (advanced standing) is awarded for courses bypassed or waived as a result of these tests.

Waiver Examinations—Several departments in Columbian College, including English, history and sociology, offer periodic waiver examinations for introductory courses. Such examinations may be attempted at the option of the student; a fee of $5 is charged. Specific departments should be consulted for further details. *Passing a waiver examination does not entitle a student to any semester hours of credit.*

Earning Additional Semester Hour of Credit

Normally, no deviation is permitted from the number of semester hours of credit given in parentheses after the title of each course. In exceptional circumstances, however, and with the prior approval in writing of the instructor and the dean, a student may register for and earn an additional semester hour of credit in certain appropriate second-group (upper-division) courses by doing a significant amount of extra work as assigned and supervised by the instructor. This privilege is not applicable during the Summer Sessions.

PREPROFESSIONAL REQUIREMENTS

Students who plan to major in any program offered by the School of Public and International Affairs are registered during the freshman and sophomore years in Columbian College. Requirements for the first two years of these programs, as well as requirements for the premedical program, are listed on the following pages.

Premedical Curriculum

A premedical student who intends to work toward a bachelor's degree fulfils the general requirements of Columbian College (see pages 72-73), and may follow the major field curricula of any Columbian College department. Each premedical program must be approved by the premedical advisor. For admission to most medical schools the student must have a minimum of 90 semester hours applicable towards a degree in an approved college of arts and sciences; the 90 hours must include

1. *Biology*: eight semester hours. This may be either in general biology or zoology but may *not* include separately credited courses in botany.
2. *Chemistry*: eight semester hours of general inorganic chemistry (which may include qualitative analysis), including four semester hours of laboratory, and six to eight semester hours of organic chemistry, including laboratory.
3. *Physics*: eight semester hours, including at least two semester hours of laboratory.
4. *English*: six semester hours. This may be the usual introductory college course or its equivalent.

Many medical schools have additional entrance requirements, among which are courses in biochemistry, embryology, histology, genetics, and mathematics. Even where such courses are not actually required, they are strongly recommended.

With the exception of these specific requirements applicants are urged to follow their personal interests in developing their premedical courses of study. A well-balanced program, rather than a specific field, is the criterion by which an applicant is judged. It is not advisable to take courses that appear to cover subject matter in the medical program.

While well-qualified candidates are eligible for admission after completing the minimum 90 semester-hour requirement, the majority of applicants are found to be better prepared for the study of medicine after four years of college work.

Chinese Language and Literature

The first two years in preparation for the Bachelor of Arts degree with a major in Chinese Language and Literature in the School of Public and International Affairs consists of a minimum of 60 semester hours. Each student must, during the freshman year, demonstrate adequate achievement in English Composition, either by examination or by taking Engl 9 or 10, and Engl 11 or 12. The student must also undertake a meaningful initiation into the three divisions of knowledge: humanities, natural and mathematical sciences, and social sciences. As the major field represents one of these three areas, the requirement may be fulfilled by taking no less than six semester hours of approved introductory courses, or six semester hours in approved advanced courses if the student is qualified and receives the instructor's permission, in the natural and mathematical sciences and in social sciences. Students must include in their program of study Chin 1-2, 3-4, and 9; Chin 7-8 and 9; or Chin 5-6. Chin 5-6 is preferred.

East Asian Studies, Middle Eastern Studies, or International Affairs Curriculum

First two years in preparation for the Bachelor of Arts degree in the field of East Asian Studies (China or Japan), Middle Eastern Studies, or International Affairs in the School of Public and International Affairs.

		Semester Hours
English:	Engl 9 or 10, and 11 or 12	6
Humanities or AmCv:	Art 31–32 or 71–72; *Literature (American, Chinese, East Asian, English, French, German, Greek and Latin, Italian, Slavic, or Spanish). Mus 3–4 first or second-group philosophy courses; Rel 21, 59–60; or AmCv 71–72	6
†Language:	Chinese, Japanese, French, German, Hebrew, Italian, Russian, or Spanish	12–16
Math/Science:	BiSc 3–4 or 11–12; Chem 3–4 or 11–12; Geol 1–2; Math 9 and 10 or 30 and 31. Phys 1 and 2 or 9–10, or one course selected from Stat 51, 53, 91, 111, and one course selected from Stat 97, 105, 112	6–8

* [illegible] 6 semester hours of literature in any foreign language this cannot be used [illegible] the language requirement.

† [illegible] is required for East Asian Studies (China focus) majors; Japn 4 is required for East Asian Studies (Japan focus) majors. Greek and Latin are not acceptable for International Affairs majors. Middle Eastern Studies majors may substitute other languages with the approval of the program advisor.

		Semester Hours
Social Science:	Econ 1–2; Hist 40 and 72; PSc 1 and 2, or 2 and 3, and 91	21
*Elective:		6–12
	Total	60

Public Affairs Curriculum

First two years in preparation for the Bachelor of Arts degree in the field of Public Affairs in the School of Public and International Affairs:

English:	Engl 9 or 10, and 11 or 12	6
Humanities or AmCv:	Art 31–32 or 71–72; †Literature (American, Chinese, English, French, German, Greek and Latin, Italian, Slavic, or Spanish); Mus 3, 4; first- or second-group Philosophy courses; Rel 21, 59–60; AmCv 71–72	6
Language or Statistics:	NOTE: This requirement may be satisfied by two years of one foreign language‡ or 12 semester hours of statistics. Statistics courses taken to fulfill this requirement may not also satisfy the math/science requirement below.	12
Math/Science:	BiSc 3–4 or 11–12; Chem 3–4 or 11–12; Geol 1–2; Math 9 and 10 or 30 and 31; Phys 1 and 2 or 9–10; or one course selected from Stat 51, 53, 91, 111, and one course selected from Stat 97, 105, 112	6–8
Social Science:	Econ 1–2, Hist 40 and 71–72; PSc 1 and 2, or 2 and 3	21
*Elective:		7–9
	Total	60

Urban Affairs Curriculum

First two years in preparation for the Bachelor of Arts degree in the field of Urban Affairs in the School of Public and International Affairs:

English:	Engl 9 or 10, and 11 or 12	6
Humanities or AmCv:	Art 31–32 or 71–72; Literature (American, Chinese, English, French, German, Greek and Latin, Italian, Slavic, or Spanish); Mus 3, 4; first- or second-group philosophy courses; Rel 21, 59–60; or AmCv 71–72	6
Math/Science:	BiSc 3–4 or 11–12; Chem 3–4 or 11–12; Geol 1–2; Math 9 and 10 or 30 and 31; Phys 1 and 2 or 9–10 NOTE: If a student elects two years of a foreign language, two semesters of statistics courses may be substituted for the math/science requirement.	6–8
Social Science:	Econ 1–2, Hist 71–72, and PSc 2	15

* Credit is not given for courses elected in the Department of Human Kinetics and Leisure Studies.

† If a student elects six semester hours of literature in any foreign language, this cannot be used to satisfy the language requirement.

‡ Greek and Latin are not acceptable for satisfying the foreign language requirement for Public Affairs majors.

		Semester Hours
	Six semester hours selected from the following: Hum 40, 721; Soc 2	6
*Elective:	Students may substitute some of the required courses for the major (see page 170) for elective courses during the sophomore year	16–18
	Total	57

DEGREE PROGRAMS

ASSOCIATE IN ARTS DEGREE

The Associate in Arts Degree may be granted to a student who has completed 60 semester hours in arts and sciences with acceptable grades, and who has fulfilled the general requirements described on pages 72-73. In addition, the degree may be awarded to pre-public and international affairs students upon completion of the curriculum specified for the first two years of the appropriate program. The last 15 semester hours of the program of study must be completed in residence in Columbian College. A student wishing to receive this degree must file an Application for Graduation and pay the $10 graduation fee at the time of registration for the semester or summer session in which the requirements will be completed.

THE BACHELOR'S DEGREES

Columbian College offers programs leading to the degrees of Bachelor of Arts and Bachelor of Science.

In cooperation with the School of Medicine and Health Sciences a seven-year curriculum leading to the combined degrees of Bachelor of Arts and Doctor of Medicine is offered.

Requirements for the Degrees

SCHOLARSHIP

One hundred and twenty hours of course work must be passed and a quality-point index of 2.00 achieved in courses graded on a four-point scale. At least 60 hours of course work, including the general course requirements of Columbian College, must be taken outside the major-field department or major program.

The index is obtained by dividing the number of quality points by the number of semester hours of courses passed with grades of *A*, *B*, *C*, or *D*. Both the number of quality points and the number of semester hours of courses are based on the student's record at this University. The index is computed as follows: *A*, four points; *B*, three points; *C*, two points; *D*, one point.

*Elective is not given for courses elected in the Department of Human Kinetics and Leisure Studies.

D, one point for each semester hour which the student has taken. Courses marked *F*, *W*, *I*, *NC*, or *CR* are not considered in determining the index, though courses passed with *CR* count toward the 120-hour overall requirement. (When a formal grade is recorded for an *Incomplete*, a grade of *D* or better will be included in the computation of the index.) A grade of *Incomplete* which is not removed within one semester is automatically changed to an *F*. Grades earned in courses taken at another institution are not considered in computing the index. At the time of graduation, a student must be in good academic standing. See page 84 for scholarship requirements applicable specifically to departmental majors.

RESIDENCE

For the standard 120-semester-hour program—A minimum of 30 semester hours, including at least 12 hours in the major field, must be completed in residence in Columbian College. *Unless special permission is granted by the dean to pursue work elsewhere, the work of the senior year must be completed in residence.* This requirement applies to students transferring within the University as well as to students transferring from other institutions.

For the 90-semester-hour program—The last 60 semester hours, including at least 12 hours in the major field, must be completed in residence in Columbian College.

Summer work may be counted in residence. For regulations governing students who are absent from the University for one semester or more, see "Inactive Status," pages 48-49.

CURRICULUM REQUIREMENTS

A change in degree candidacy within Columbian College (e.g., from Bachelor of Arts to Bachelor of Science) requires the permission of the dean. The degree requirements effective at the time the change is approved must be met.

First-group courses may be required as prerequisites to the major, but because of their introductory character they cannot be counted as part of such programs. (See "Explanation of Course Numbers," pages 103-94.)

CREDIT/NO CREDIT OPTION

A junior or senior student in Columbian College who is in good standing may, with the approval of the advisor and the dean, take one course a semester and receive a grade of *CR*, Credit, or *NC*, No Credit. No student will be allowed to take more than four credit/no credit courses under this regulation. The student may, however, also receive grades of *CR*/*NC* in the proseminar for field of study majors and in other courses normally using such grades. A student must sign up for the credit/no credit option at registration. Under no circumstances may a student change from credit/no credit status to graded status, or vice versa, after the end of registration. Courses required in the student's major field (courses required in the major department or those required outside the major department) may not be taken on the credit/no credit basis. A transfer student may not choose this option until the second semester of enrollment in this University.

TUTORIAL STUDY

A junior or senior of demonstrated capacity, with a special interest in the subject matter of a regularly listed course, may be permitted to take tutorial study in residence under the personal direction of the instructor, in accordance with the rules of the appropriate department and with the approval of the dean. Credit under this plan is limited to the specific semester hours of credit designated for each course in the list of courses of instruction. It assumes frequent and regular conferences between the student and instructor.

THE STANDARD 120-SEMESTER-HOUR PROGRAM

One hundred and twenty semester hours of course work are required for graduation. At least 60 hours of course work, including the requirements stated on pages 72-73 and 79-80, must be taken outside the major department or program. The student should consult the advisor at each registration about choice of courses.

Each student should declare a major as soon as possible, preferably upon completion of 30 semester hours. A student may change the major with the consent of the dean and of the department or committee concerned; the student must meet the requirements for the new major in effect at the time the change is approved.

Students transferring from other institutions or from other schools, colleges, or divisions in this University, with major requirements wholly or substantially met, must satisfy the residence requirement of Columbian College (see page 80).

THE 90-SEMESTER-HOUR PROGRAM

The 90-semester-hour degree program is designed for the exceptionally able student. This program, which leads to the regular Columbian College degrees, makes it possible to graduate in three normal academic years with a total of 90 semester hours of credit instead of the standard 120. Students in this program must complete all of the requirements for the three-year degree in the semester in which the 90th semester hour is achieved.

The requirements for this program are (1) 90 semester hours of credit earned in college courses (that is, the 90-hour requirement may not be reduced by credit earned through examinations); (2) completion of the chosen major-field program and general curricular requirements; (3) grades of A in at least 45 semester hours of course work and no grades below C; (4) at least 60 semester hours of credit earned in 100-level courses; and (5) recommendation of the major department or program.

To be eligible for this program, the student must show evidence of exceptional academic ability by college record, performance in college courses, and other appropriate information.

An interested student should make application directly to the major-field departmental chairman or program director as soon as possible, preferably by the end of the first year of study. The student's academic record to that point will, of course, provide a useful criterion of eligibility.

A transfer student may qualify for graduation under the 90-hour program provided the student completes at least 60 semester hours of the approved three-year program in Columbian College, earns grades of A in no less

than 45 semester hours of such course work at this University, and has no grades below C.

A student who fails to maintain the required academic performance while studying toward the 90-hour degree program simply continues for the standard 120-hour degree.

Bachelor of Arts

The Bachelor of Arts degree is offered in the following fields:

American Civilization
American Literature
Anthropology
Applied Mathematics
Applied Statistics
Art History
Biology
Botany
Chemistry
Chinese Language and Literature
Classical Archeology and Anthropology
Classical Archeology and Classics
Classical Humanities
Dramatic Art
Early Modern European Studies
Economics
English Literature
Environmental Studies
Fine Arts
French Language and Literature
Geography
Geology
Germanic Languages and Literatures
History
Journalism
Judaic Studies
Latin American Studies
Mathematical Statistics
Mathematics
Music
Philosophy
Physics
Political Science
Psychology
Religion
Russian Language and Literature
Russian Literature and Culture—In Translation
Sociology
Spanish-American Literature
Spanish Language and Literature
Speech Communication and Broadcasting
Speech Pathology and Audiology
Statistics (Computer Science option)
Zoology

Combined Degrees of Bachelor of Arts and Doctor of Medicine

A candidate for the combined degrees of Bachelor of Arts and Doctor of Medicine must (1) complete the entrance requirements for the Doctor of Medicine degree in the School of Medicine and Health Sciences; (2) complete the general requirements stated on pages 72-73 and 79-80; (3) accumulate 90 semester hours in the liberal arts, including a minimum of 30 in second-group courses in Columbian College; (4) obtain the approval of the Dean of Columbian College at the time of entering the School of Medicine and Health Sciences; (5) obtain the recommendation of the Dean for Academic Affairs of the Medical Center at the completion of all prescribed courses in the first year of the School of Medicine and Health Sciences, at which time the degree of Bachelor of Arts will be conferred (professional work taken at another institution will not satisfy the major requirement of the combined degrees); (6) maintain throughout the entire course the scholarship level required for graduation.

Bachelor of Science

The Bachelor of Science degree is offered in the following fields:

Applied Mathematics
Applied Statistics
Biology
Botany
Chemistry
Environmental Studies
Geology
Geology (Engineering option)
Mathematical Statistics
Mathematics
Physics
Zoology
Statistics (Computer Science option)

The Undergraduate Major

There are two types of undergraduate majors: the Field-of-Study major and the Departmental major. Five majors—Classical Archeology and Anthropology, Classical Archeology and Classics, Environmental Studies, Judaic Studies, and Latin American Studies—although interdepartmental in nature, are governed by the regulations of the Departmental major.

FIELD-OF-STUDY MAJOR

Each Field-of-Study major covers a carefully worked out field of coordinated study and is under the supervision of the appropriate department and the Columbian College Committee on Curriculum.

The Field-of-Study major requires no specific program of courses, although the student is required to meet the over-all general requirements for the degree. Ability to pass the Major Examination is assumed to be a convincing demonstration that the student possesses the breadth, depth, and quality of knowledge of the major usually defined in terms of semester hours, courses, and grades. Information on each field is obtainable from the department. Immediately upon declaring a major, students should consult the appropriate department so that they may be assigned an advisor.

The Field-of-Study major places special emphasis on the intellectual development of the individual student. Programs in the same major may vary, depending upon the individual student's background, previous study, and aptitudes. The student is expected to consult the advisor frequently, and the special proseminars offered in some fields give the student further opportunity for individual advice and direction in pursuing a program especially adapted to individual needs and abilities. A close student-advisor relationship is essential for the student's success under the Field-of-Study major plan.

The following Field-of-Study majors are offered: American Civilization, American Literature, Chinese Language and Literature, English Literature, French Language and Literature, History, Russian Language and Literature, Russian Literature and Culture—in Translation, Spanish American Literature, Spanish Language and Literature.

Proseminar in the Major.—A proseminar is offered in most fields to help the student acquire a coordinated knowledge of the chosen field through reading, study, and laboratory exercises. It is a presentation of the content and methods of the major field as a whole through the organization and coordination of the knowledge obtained in the various formal courses in the major subject and of material not usually included in such courses. This course is not required, but, if it is elected, strict attendance is essential. Six semester hours, but no qualitative grade, may be assigned. When registered in this course, the student has the privilege of visiting, subject to the approval of the instructor, any other appropriate course offered in

the College. (Regular attendance in a course, either for credit or as an auditor, requires registration and payment of tuition.) Proseminars are open only to the student who has been accepted as a candidate under that specific major.

The Major Examination—The Major Examination will normally be taken at the close of the senior year; a student on a limited schedule may take it no earlier than one calendar year before graduation. A student who fails to pass a Major Examination may, at the discretion of the Committee on Curriculum, be re-examined at a later regular major-examination period. The Committee on Curriculum has general supervision of the preparation, reading, and grading of Major Examinations. Major Examinations are held each semester on dates fixed by the department or departments concerned, but in no case later than December 1 for the fall semester, April 13 for the spring semester, and August 26 for the summer sessions.

DEPARTMENTAL MAJORS

Departmental majors, unlike Field-of-Study majors, are defined in terms of credit hours, required courses, and the attainment of grades no lower than *C* in the minimum required second-group courses taken in the major field. A *D* in a required course will satisfy a curricular requirement in the major, but it will not count toward the minimum number of hours required in the major. (A department may require a degree candidate to repeat a required course in which a *D* was received. See page 44.) The minimum specific requirements for Departmental majors are listed below the staff of instruction of the department concerned. The chairman of the department, or designated departmental advisor, should be consulted at registration concerning the student's program of courses; and the entire program, including electives, must be approved by the department. The student is also expected to consult the chairman or adviser in all matters affecting the program of studies, such as changes, substitutions, or withdrawals, and especially concerning the student's progress in a course. A close student-advisor relationship is desirable.

Departmental majors are offered in the following: American Literature, Anthropology, Applied Mathematics, Applied Statistics, Art History, Biology, Botany, Chemistry, Classical Archeology and Anthropology (interdepartmental), Classical Archeology and Classics (interdepartmental), Classical Humanities, Dramatic Art, Economics, English Literature, Environmental Studies (interdepartmental), Fine Arts, Geography, Geology, Geology (engineering option), Germanic Languages and Literatures, History, Journalism, Judaic Studies (interdepartmental), Latin American Studies (interdepartmental), Mathematical Statistics, Mathematics, Music (Music History and Literature, Music Theory, Applied Music), Philosophy, Physics, Political Science, Psychology, Religion, Russian Language and Literature, Sociology, Speech Communication and Broadcasting, Speech Pathology and Audiology, Statistics (computer science option), Zoology.

DOUBLE MAJORS

With the prior approval of the departments concerned, a student who completes the requirements of two major fields in Columbian College (for

example, mathematics and physics, or English and Latin, or history and economics) may graduate with a double major. Such a student should consult with advisors in the two departments concerned and officially declare both majors on the appropriate forms available in the dean's office. A double major must be taken in departments offering the same degree (either the B.A. or the B.S.); a major field in Columbian College cannot be combined with a major field offered by another degree-granting unit of the University.

INTERDISCIPLINARY PROGRAMS

Regular Interdisciplinary Programs—Several programs presently exist, including American Civilization, Classical Archeology and Anthropology, Classical Archeology and Classics, Early Modern European Studies, Environmental Studies, Judaic Studies and Latin American Studies.

Special Interdisciplinary Programs—A student who finds no existing major or program suited to individual educational goals may develop a special major program, in consultation with appropriate departmental advisors. Final approval of such a program rests with the Committee on Curriculum. Only programs with valid and clearly defined academic goals will be approved, and each shall be designated by a title suggested by the student to the Committee on Curriculum for approval. At least 45 semester hours of credit of the approved program must be completed in Columbian College. Because of their broad scope, such interdisciplinary majors may not be combined with a double major.

A student in an interdisciplinary program will be expected, during the second semester of the senior year, to take a comprehensive examination (either oral or written) in the interdisciplinary field, or to undertake a senior comprehensive thesis, at the discretion of the student's interdepartmental committee.

Special Interdisciplinary Courses—Under the supervision of the Committee on Curriculum, new courses will be offered each semester combining the methods and insights of several disciplines. Interested students should consult the current *Schedule of Classes*, where they will find such courses numbered 701 and 721. These courses do not satisfy the requirement of meaningful initiation into the three divisions of knowledge (see Columbian College General Course Requirements).

GRADUATE SCHOOL OF ARTS AND SCIENCES

Dean H. Solomon
Assistant Deans A.D. Andrews, E.A. Caress, D.A. Rowley, C.E. Rice

FACULTY AND CONSULTANTS

Faculty*

Professors E. Abravanel, L.F. Affronti, E.N. Albert, F.D. Allan, J.G. Allee, Jr., J. Aschheim, D.L. Atkins, J. Axelrod, J.M. Bailey, R.L.A. Bari, O. Bergmann, S. Bloom, L.S. Bowling, H.F. Bright, A.D. Britt, R.G. Brown, J.F. Danks, W.E. Caldwell, E.A. Caress, G.V. Carroll, M.M. Cassidy, I.H. Cisin, A.G. Coates, V.H. Cohn, J. Cornfield, T.F. Courtless, Jr., R.H. Davison, L.G. DePauw, R.M. Dunn, Jr., J. Eisenstein, S.E. Fabro *(Research)*, N. Filipescu, L.A. Frey, R.N. Ganz, Jr., J.L. Gastwirth, A.L. Goldstein, M. Gordon, S.W. Greenhouse, F. Griffith, F.S. Grubar, A. Gyorgy, S.E. Haber, R.C. Haskett, R. Hertz *(Research)*, P.H. Highfill, Jr., P.P. Hill, J.W. Hillis, H.C. Hinton, H.H. Hobbs, M.A. Holman, C. Hsieh, K. Huang, R. Hugh, R.L. Humphrey, Jr., M.J. Jackson, T.N. Johnson, R.G. Jones, H.D. Jungbeen, I. Katz, J.W. Kendrick, R.A. Kenney, R.W. Kenny, H. Kenyon, Y. Kim, J.C. King, A.D. Kirsch, P.F. Klarén, R.M. Krulfeld, T.Z. Lavine, H.L. LeBlanc, P.H.M. Lengermann, E.M. Lerner, H. S. Levitan, B.I. Levy, J.B. Levy, J.F. Lewis, R.K. Lewis, H.W. Lilliefors, R.C. Lindholm, C.D. Linton, T.P.G. Liverman, W.F.E. Long, J.C. Lowe, H.G. Mandel, P. Mazel, G.E. Mazzeo, M.L. Meltzer, I.W. Millar, F.N. Miller, J. Miller, G.C. Mondale, L.A. Morgan, Jr., J.N. Mosel, C.A. Mozer, N.N. Natov, D. Nelson, B. Nimer, C. O'Rear, R. Parris, T.P. Perros, V. Petrov, E.L. Phillips, F. Pinto, R.E. Purcell, J.P. Reesing, Jr., B. Reich, C.E. Rice, J.W. Robb, H.M. Sachar, B.M. Sapin, S.O. Schiff, R.H. Schlagel, W.E. Schmidt, L.G. Schwoerer, R.P. Sharkey, R.H. Shumway, H. Soloway, F.R. Strobel, G. Stone, D.E. Silber, B.W. Storch, R.S. Swall, H. Salomon, G. Stanchak, J.E. Starrs, G. Steiner, G. Steiner, R.W. Stephens, C.T. Stewart, Jr., J.A. Straw, C. Tarn, D.H. Teller, K. Thorneck, R.B. Thompson, R. Thornton, C.S. Tuthill, M.E. Tuthill, G.V. Valsamy, R.D. Walk, R.H. Walker, Jr., D. Wallace, Jr., R.A. Wallace, F.R. Weismiller, D.G. White, R.E. Wood, **H.B. Yakobson, H.E. Yeide, Jr., A.J. Zuchelli**

Adjunct Professors T.E. Bowman, J.C. Broderick, F.A. Chace, Jr., R.G. Crystal, R.C. Cuilo, D. Gillespie, E.C. Kaufman, W.M. Leach, W.H. Lewis, C.C. McWright, J.C. Parmelian, J.W. Pierce, H.A. Rehder, I.G. **Sohn, G. Todaro**

Associate Professors F.P. Abramson, Y. Al-Doory, A.D. Andrews, S.R. Barnett, J.R. Barth, L. Brandt, Y. Chu *(Research)*, M.A.B. Golland, R.L. Cole, C.L. Elliott, R.S. French, C.T. Garrett, H.L. Gates, H.F. Gilbert, L.L. Gilra, R.S. Goldfarb, V.K. Golla, M.D. Green, W.B. Griffith, R.A.

* The President of the University, the Vice President for Academic Affairs, the Registrar of the University, the Director of Admissions of the University, and the University Librarian are ex officio members of the Faculty of the Graduate School of Arts and Sciences.

Hadley, D.R.K. Henney, C.J. Herber, A.J. Hiltebeitel, R.W. Holmstrom, T.L. Hufford, C.T. Ireland, K.E. Johnson, W.R. Johnson, S.A. Karp, S.G. Kent, N.K. Khatcheressian, P.D. Kind, M. King, P. Klubes, R.E. Knowlton, M.J. Koering, R.A. Lavine, M.P. Lee, D.R. Lehman, C.A. Linden, C.W. Linebaugh, J.M. Logsdon, G. Ludlow, J.H. Maddox, H. Merchant, B.M. Mergen, H.R. Nau, G.A. Olkhovsky, R.K. Packer, W.C. Parke, E.O. Pederson, J.A.A. Plotz, P.J. Poppen, J.A. Quitslund, M. Reich, L. Rothblat, D.A. Rowley, P.G. Saenz, S.L. Simons, C.W. Sten, E.A. Stone, M.F. Taragin, D.H. Teller, I. Thompson, N.A. Tilkens, J.L. Tropea, C.E. Tuthill, G.A. Walker, D.W. Watkins, S.J. Wayne, J.F. Wright, Jr., A.M. **Yezer, R.Y. Yin, B.C. Zook**

Adjunct Associate Professors K. Krell, W. Merrick, J. Schlom

Assistant Professors R.J. Anderson, I. Azar, S.R. Barnett, M.E. Boeckmann, A.S. Brooks, A.R. Bruhn, G. Carter, R.L. Combs, J.P. Dirkse III, R.P. Donaldson, R.K. Evans *(Visiting)*, D. Fischer, I.L. Gallo, N.C. Garner, S.K. Green, F. Griffith, S. Hashtroudi, D.E. Johnson, J.M. Kerns, N. Lappas, D.L. Lee, D. McAleavey, C. McClintock, A.L. Mescher, S.N. Nefici, J.M. Orenstein, G. Paster, W.F. Rowe, O.A. Seavey, R.P. Seifert, S. Shaffer, R.C. Sickles, R. Sines, A.H. Smith, P.L. Stewart, A.M. Suria, **J.M. Thibault, W.T. Woodward**

Adjunct Assistant Professors E. Bloomfield, S.L. Connelly, J.D. Fife, H.Y.L. **Kwiatkowska, C.R. Merril, P.A. Palmer, E. Ulman**

Dean's Council

H. Solomon *(Chairman)*, J.F. Burks, P.P. Hill, M.J. Jackson, M.J. Koering, **H.L. LeBlanc, F.R. Siegel, D. Wallace, Jr.**

Consultants in Research

R.S. Adelstein, J. Adkins, E.P. Anderson, W.F. Anderson, A.A. Ansari, R. Asofsky, J.L. Barnard, J. Bellanti, L. Bilker, E.J. Blanchette-Mackie, L. Bockstahler, C. Boone, W. Bowman, M.F. Brennan, M. Brightman, S.W. Burks, C.P. Butcher, K.J. Catt, K. Chang, J.Y. Cole, Jr., B. Collette, R.E. Darcy, C. Dawe, J. Farrar, M.R.S. Fox, J.E. Fredland, E. Freese, R.M. Friedman, J.D. Gardner, R. Gibbs, Jr., F.R. Goff, J. Goldstein, R. Goldstein, J. Granger, G. Guroff, J. Hardt, J.E. Hazel, R. Herberman, P.N. Herbert, G. Hodgen, J.M. Holmes, L. Horton, R. Houbrick, T. Hunt, D. Jacobowitz, M.L. Jones, S. Jong, R.K. Kahn, M.W. Kranz, F.M. Kregenow, L.P. Leite, L.S. Lessin, R. Levy, D. Liu, D.R. Livengood, W.M. Lovenberg, P. Lundeberg, W. Madow, R. Mage, R.W. Manderscheid, S.R. Mazzur, B.F. Meeker, M. Mishkin, J. Mitchell, B.R. Murphy, W.G. Nash, J.C. Osborne, Jr., D.B. Parsons, A. Peacock, J. Pisano, J.W. Porter, R.M. Pratt, Jr., A. Raskin, W.D. Rasmussen, A. Richman, G.S. Roth, A.N. Schechter, F.L. Schmidt, L.P. Schultz, D. Segal, R.S. Sigafoos, L.B. Smith, L. Sokoloff, J.R. Stephenson, S. Stewart, K.L. Storrs, C.W. Tabor, H. Tabor, J.F. Tallman, R. Ting, R.W. Wannemacher, Jr., **W.E. Washburn, S.H. Weitzman**

Field of Studies Consultants

D. Ari, W. Back, T. Bower, J. Carr, C. Carson, G. Evans, J. Federico, J. Flint, J. Fulton, S. Hobbs, A. Jabbour, J. B. Kuiper, A. MacTavish, V. McKay, E. Myette, J.N. Norris IV, H.Z. Rand, S.I. Shibko, J.W. Witherell

HISTORY AND ORGANIZATION

The Graduate School of Arts and Sciences is responsible for advanced study and research leading to Master's degrees in the arts and sciences and the degree of Doctor of Philosophy. Graduate programs at George Washington University were first formally organized under the Graduate School in 1905, following several decades of gradual growth in a number of departments. In 1930 the Graduate School was discontinued. Columbian College, the University's liberal arts college, then assumed responsibility for the Master of Arts and Master of Science degrees, and a newly created Graduate Council administered all Doctor of Philosophy programs. Professional schools took responsibility for advanced degrees in the professional fields.

In 1967 the Graduate Council and the Graduate Division of Columbian College were consolidated into a new Graduate School of Arts and Sciences. All graduate programs in the arts and sciences leading to the degrees of Master of Arts, Master of Arts in Special Studies, Master of Fine Arts, Master of Forensic Sciences, Master of Music, Master of Science, Master of Science for Teachers, Master of Science in Forensic Science, Master of Science in Special Studies, and Doctor of Philosophy are under the Graduate School.

In addition, a Master of Philosophy degree is awarded by the School, upon recommendation of the appropriate department, to students who have successfully completed the General Examination for the Doctor of Philosophy degree.

The School is under the direction of the Graduate Faculty of Arts and Sciences. It is the responsibility of the Faculty to set the requirements for admission to the School, to provide courses and programs of study and research for its students, to establish academic standards for its degrees, to recommend to the Board of Trustees the awarding of degrees, to lay down regulations as needed for the operation of the School, and generally to supervise its activities.

The administration of the School is vested in the dean, who is chairman of the Dean's Council, which is responsible to the Faculty of the School for all policy matters.

ADMISSION REQUIREMENTS

Application forms for admission to graduate study are obtained from the Office of the Dean of the Graduate School of Arts and Sciences. When completed, these application forms must be submitted to this office, together with college transcripts and letters of reference, and other information as required by the department or program. Admission is dependent on departmental recommendation and approval by the dean.

Applicants must have academic backgrounds of excellence, usually with majors, or equivalent, in the fields in which they intend to study for advanced degrees. Normally, a *B* average (or equivalent) from an accredited college is required. With evidence of special promise, such as high Graduate Record Examination scores, an applicant may be accepted whose academic record falls short of *B*. The minimum does not assure automatic acceptance. The departments may, and often do, set higher admission standards. Moreover, the number of spaces available for new graduate

students limits the number that can be accepted. Students who apply in their senior year must have completed their baccalaureate work before registration in the Graduate School and must present evidence of such completion. Students whose native language is not English are required to take the *Test of English as a Foreign Language* (TOEFL), administered by the Educational Testing Service, Princeton, N.J. (see pages 25-26).

Application for Admission—Applicants who are requesting fellowship support must submit completed applications by February 15 (February 1 for students in clinical psychology and art therapy) for admission in the fall semester and by November 1 for admission in the spring semester. Applicants for the on-campus Master of Arts in Special Studies must have all application materials in the Graduate School Office by July 15 for the fall semester, November 1 for the spring semester, and April 15 for the summer sessions. Applications for graduate study without fellowship support made after these dates are acceptable for admission in the corresponding semester and will be reviewed if time permits and if space is available in the program desired. More time than normal may be required to process applications submitted during June, July, and August.

Readmission—A student who wishes to resume a graduate program which had been interrupted, must file an application form to be considered for readmission. Readmission is not guaranteed, and the application is subject to review by the department concerned and the dean. The student may be required to take qualifying examinations on the course work completed. Application forms are available in the Graduate School Office.

REGULATIONS

Regulations regarding admission, registration, fees, and finances are stated on pages 20-32, other University regulations, on pages 44-52.

In addition, the Graduate School publishes a Student Handbook each academic year which contains updated information on the School's policies, regulations, and other matters of concern to enrolled or admitted students. It is the responsibility of the student to be aware of the information contained in this *Bulletin* and the Handbook.

Grades

Grades for graduate work are *A*, Excellent; *B*, Good; *C*, Minimum Pass; *F*, Fail; *I*, Incomplete; *W*, Authorized Withdrawal; *CR*, Credit.

The symbol *I* (Incomplete) indicates that a satisfactory explanation has been given to the instructor for the student's failure to complete the required work for a course. The "Incomplete" must be made up before the lapse of one calendar year. An "Incomplete" for regular course work which is not removed within one calendar year remains permanently as a grade of *I* on the student's record. The grade of *I* cannot be removed by reregistering for the course here, or by taking its equivalent elsewhere.

The grade of *I* is also given for all thesis and dissertation research courses until the thesis or dissertation is completed. Upon the satisfactory completion of the thesis or dissertation the grade *I* is changed to *CR* automatically. The grade of *CR* is given for an *Advanced Reading and Research* (usually numbered 398) course.

Scholarship Requirements

Graduate students are required to maintain a minimum accumulative grade average of *B* (3.00) in all course work taken following admission to the Graduate School. Individual departments may require a higher average. The fields of art history, English, and psychology require a 3.25 average. If the required grade average is at any time not maintained, the student's degree candidacy is subject to termination.

In the case of a student who receives a grade of *F* for a course in the program of studies, the Graduate School will require a written statement from the department justifying the student's continuance in the Graduate School and outlining the program to be followed. Continuation is contingent upon the dean's approval. When a grade of *F* is received for a course in the program of studies, the grade is included in the student's grade point average whether or not the course is repeated.

A student may repeat for credit a course in which a grade of *C* or above was received only when permitted to do so by the department concerned, unless the course description states that the course may be repeated for credit. A written statement to this effect must be submitted for approval to the dean's office by the appropriate departmental advisor. It is then filed with the Registrar. If a course is repeated for credit, the first grade received remains on the student's record and is included in the student's grade point average.

A graduate student may take an advanced undergraduate course (courses numbered 101-200) for graduate credit only upon the approval of the dean and the department at the time of registration. Such approval is granted only with the provision that the student complete additional work in order to receive graduate credit.

Program of Studies

The program of studies must be approved by the dean and the departmental advisor and filed in the Graduate School Office no later than November 1 for graduate students entering in the fall semester, or March 15 for graduate students entering in the spring semester. A program of studies may be revised, when necessary, by obtaining the approval of the departmental advisor and the dean. The revision must be filed in the Graduate School Office. A completed course cannot be dropped from the program of studies unless it is due to an error in advising or an administrative error. Such a change in the program requires the approval of the dean.

Continuous Enrollment

All students must be continuously enrolled while working toward a degree, except during the summer sessions. If continuous enrollment is not maintained, the student is dropped from the degree program unless a leave of absence is granted by the Graduate School.

Master's candidates should meet the calendar deadline for completing the degree as specified in the program of studies. If the deadline is not met, assuming academic approval for an extension which may be granted in exceptional circumstances, the student must register and pay for six credit hours of "Reading and Research" each semester.

Doctoral students in the first unit of their programs shall meet the calendar deadline for completing this unit as specified in the program of studies. Completion of the first unit includes satisfactory completion of course work, tool requirements and the General Examination. If the deadline is not met, assuming academic approval for an extension which may be granted in exceptional circumstances, the student must register and pay for six semester hours of "Reading and Research" each semester. These hours will not be credited toward completion of the degree. Doctoral students in the second unit of their programs, i.e., dissertation research, should complete this unit as specified in the program of studies. If the deadline is not met, assuming academic approval for an extension which may be granted in exceptional circumstances, the student must register and pay for six semester hours of "Reading and Research" each semester.

Leave of Absence

A student who is temporarily unable to continue the program of studies may request leave of absence for a specific period of time, not to exceed one calendar year during the total period of degree candidacy. When the period of leave has expired, it is the student's responsibility to notify the Graduate School at least two months in advance of a given registration period of intention to reregister. If a student fails to reregister, the candidacy is terminated.

Withdrawal

Graduate students who intend to withdraw from the Graduate School should inform the School in writing. The last day for complete withdrawal without academic penalty is at the end of the eighth week of classes.

Graduation Requirements

All students must file an Application for Graduation and pay the required graduation fee at the time of registration for the last semester or summer session of the final year in which they intend to graduate. Students must be registered in the Graduate School during the semester they plan to graduate. Master's and doctoral candidates may graduate in May, February, or September. Students who have completed the requirements for a degree but have not yet been awarded the degree will be issued a letter to this effect upon request.

DEGREES

Listed below are the degree programs of the Graduate School of Arts and Sciences and the specific degrees offered, by field. The programs are directed by the departments concerned. Degree programs which bridge two or more departments are directed by committees composed of members of the departments concerned. For further information write to the dean or the chairman of the appropriate department.

The degrees of Master of Arts in Special Studies and Master of Science in Special Studies are designed for students who do not wish to concentrate in a specific discipline. The Graduate School of Arts and Sciences

offers programs on campus leading to the degree of Master of Arts in Special Studies with concentration in Criminal Justice, Gerontology, Human Resource Studies, Women's Studies, and Philosophy and Social Policy.

Students with special academic goals may pursue individualized programs of study toward the M.A. or M.S. in Special Studies subject to approval by the Committee on Individual Programs and the dean. No more than one-third of the courses can be taken within any one department and a majority of courses must be taken within the Graduate School of Arts and Sciences. Also required is a one-semester colloquium on interdisciplinary matters. The nature of the comprehensive examination is a final essay in which the integration of the program of study is demonstrated. The School also offers Master of Arts in Special Studies and Master of Science in Special Studies degrees in specific academic areas at off-campus locations (see page 101).

Graduate Fields

The graduate course work offered in support of the degree programs in the following list is shown by department in this catalogue.

	Degrees Offered	
I. Humanities		
American Civilization	M.A.	Ph.D.
American Literature	M.A.	Ph.D.
Art:	M.F.A.	
Ceramics		
Design		
Graphics		
Painting		
Photography		
Sculpture		
Visual Communication		
Art History	M.A.	Ph.D.
Classical Archeology, Classics and History	M.A.	
Dramatic Art	M.F.A.	
English Literature	M.A.	Ph.D.
*French Literature	M.A.	Ph.D.
Germanic Languages and Literatures	M.A.	
History of Religions—Hinduism	M.A.	
Museum Studies	M.A.	
Music:	Mus.M.	
Applied Music		
Composition		
Conducting		
Music Theory		
Musicology	M.A.	
Philosophy	M.A.	
Religion	M.A.	
Religion and Medical Care	M.A.	
Religious Education	M.A.	
Russian Language and Literature	M.A.	
*Spanish-American Literature	M.A.	Ph.D.
*Spanish Literature	M.A.	Ph.D.

*Any approved combination of French, Spanish, or Spanish-American Literature is available as a Doctor of Philosophy field.

II. Social Sciences

Anthropology	M.A.	
Economics	M.A.	Ph.D.
Education Policy		Ph.D.
Geography	M.A.	
History	M.A.	Ph.D.
*International Relations		Ph.D.
Political Science	M.A.	Ph.D.
Sociology	M.A.	Ph.D.

III. Physical and Mathematical Sciences

Applied Mathematics	M.A., M.S.	
Applied Statistics	M.S.	
Chemistry	M.S.	Ph.D.
Engineering Geology	M.S.	
Forensic Sciences	M.F.S., M.S.F.S.	
Geochemistry	M.S.	Ph.D.
Geology	M.A., M.S.	Ph.D.
Mathematical Statistics	M.A.	Ph.D.
Mathematics	M.S. for Teachers, M.A.	Ph.D.
Physics	M.A.	Ph.D.

IV. Biomedical and Related Sciences

Anatomy		Ph.D.
Art Therapy	M.A.	
Biochemistry	M.S.	Ph.D.
†Biological Sciences	M.S.	Ph.D.
Genetics	M.S.	Ph.D.
Microbiology	M.S.	Ph.D.
Mycology	M.S.	
Pathology		Ph.D.
Pharmacology	M.S.	Ph.D.
Physiology	M.S.	Ph.D.
Psychology	M.A.	Ph.D.
Radiological Sciences		Ph.D.
Speech Pathology and Audiology	M.A.	

Combined Master of Science and Doctor of Medicine Degrees

Students interested in the combined degrees of Master of Science and Doctor of Medicine must meet the requirements for admission to the Graduate School of Arts and Sciences and to the Doctor of Medicine degree program of the School of Medicine and Health Sciences.

The Master of Science program consists of a minimum of 30 semester hours of credit and the fulfilling of the tool requirement (see pages 95–96). A maximum of 12 semester hours of credit for graduate-level courses *completed as a part of the Doctor of Medicine degree curriculum* (and not already applied toward the bachelor's degree) will be allowed in fulfillment of the requirements of the Master of Science degree. The remaining 16 semester hours of work, which in most programs includes a thesis, must be work in the basic medical sciences normally required for a Master of Science degree in the Graduate School of Arts and Sciences.

* The School of Public and International Affairs offers a Master of Arts field in International Affairs.

† Biology, botany, and zoology.

Dual Program for the Doctor of Medicine and Doctor of Philosophy Degrees

A dual program is available to qualified students who seek both the Doctor of Medicine and Doctor of Philosophy degrees. The requirements which must be fulfilled for both degrees are identical to those currently and separately established in the School of Medicine and Health Sciences and the Graduate School of Arts and Sciences.

A student working toward these degrees may apply a maximum of 24 semester hours of approved course work in the School of Medicine and Health Sciences toward the minimum of 48 hours of course work required to qualify for the General or Cumulative Examination for doctoral candidacy. This course work is normally taken during the semesters that alternate with the medical program and in the years following the award of the M.D. degree. The student's research for the dissertation may begin concurrently with the final 24 semester hours of graduate course work leading to the General or Cumulative Examination. The estimated time for the completion of this dual program is six years.

In order to enter the dual degree program, a prospective student first must apply for and gain admission to both the Graduate School of Arts and Sciences and the School of Medicine and Health Sciences separately through established procedures. Upon admission to both schools, the student may then apply for affiliation with the dual degree program. Work toward the Doctor of Philosophy degree is performed under the jurisdiction of a departmental doctoral committee.

REQUIREMENTS FOR THE DEGREES

The Master's Programs

Unless otherwise specified, the requirements listed below are applicable to candidates for the degrees of Master of Arts, Master of Arts in Special Studies, Master of Fine Arts, Master of Forensic Sciences, Master of Music, Master of Science, Master of Science for Teachers, Master of Science in Forensic Science, and Master of Science in Special Studies.

1. *General Requirements.* For a master's degree program *including* a thesis, the satisfactory completion of a minimum of 30 semester hours of approved graduate work, including six semester hours of thesis research, is required. For a master's degree program which does *not* include a thesis, the number of semester hours of approved graduate course work is determined by the department, and normally consists of from 30 to 36 semester hours. The program without the thesis is not an individual student option and is not available in every department. Departments can and often do set requirements above the minimum required by the Graduate School. The program of study leading to the degree of Master of Arts in Special Studies or Master of Science in Special Studies consists of 36 semester hours of approved graduate course work and does not require a thesis.

Work taken to make up deficiencies is never counted as part of the requirements leading to a master's degree. Upon approval, up to one-half of the required graduate work may be taken in courses offered by the other affiliated institutions of the Consortium of Universities of the Wash-

ington Metropolitan Area, Inc., or by another degree-granting division of this University. If credit is transferred from another institution (see "Transfer of Credit," below), the number of semester hours which may be taken at an affiliated Consortium institution is reduced by the number of hours accepted as transfer credit.

All master's degree candidates must complete degree requirements within four years. Extensions beyond this time period require approval of a written request based on specific and temporary interfering circumstances.

2. *Academic Work Load*—Full-time students register for nine to 12 semester hours each semester; part-time students must register for six semester hours each semester. These requirements do not apply to students who have fewer than nine semester hours (full-time) or six semester hours (part-time) remaining to complete their programs. No more than 15 semester hours may be taken during any one semester.

3. *Transfer of Credit*—A maximum of one-quarter of the semester hours of graduate course work required for a degree may be approved for transfer to the Graduate School from the Division of University Students, another degree-granting division of this University, or another accredited college or university. For a transfer of credit to be approved *all* of the following conditions must be met: the course work must have been taken prior to admission to the Graduate School, it must be approved as part of the student's program of studies, it must not have been applied to the completion of requirements for another degree, it must be post-baccalaureate graduate-level course work, it must have been taken within the past two years, and the student must have received a grade of *B* or better in each course for which a transfer of credit is requested. This action must be made in writing and approved by the departmental advisor and the dean. A transcript of the course work must be on file before the request can be considered.

4. *Tool Requirement*—Candidates for the degrees of Master of Arts in the field of art therapy, Master of Arts in Special Studies, Master of Arts in the field of speech pathology and audiology (nonthesis option), Master of Forensic Sciences, Master of Music, Master of Science in Forensic Sciences, and Master of Science in Special Studies; candidates for master's degrees in the Department of Mathematics; and candidates for the degree of Master of Fine Arts in the field of dramatic art need not fulfill a tool requirement. Master's candidates normally must successfully complete a tool requirement in a foreign language, mathematics, statistics, or computer programming, or by graduate course work outside the major department (see option [c] below). In place of a tool requirement, candidates for the degree of Master of Fine Arts in the fields of ceramics, design, graphics, painting, photography, or sculpture will complete a methods course selected by the Department of Art.

The tool requirement examination should be passed prior to the beginning of the third semester of graduate work; students who have not fulfilled this requirement must register for the appropriate course at the beginning of the third semester. Students who elect graduate course work outside the major department in order to fulfill the tool requirement must complete this course work before taking the comprehensive examination or undertaking thesis work. Courses taken to satisfy the tool requirement cannot be counted in the semester-hour requirement for the master's

degree. No master's candidate may attempt a tool examination more than three times. A tool requirement fulfilled at another university cannot be used to fulfill the requirement at this University.

With the approval of the department directing the student's program of study, the tool requirement may be selected from the following options:

(a) Passing a foreign language reading examination (a student may register for the appropriate reading course for nonmajors or make arrangements with the appropriate department to take the examination on the scheduled dates). A student majoring in a foreign language may not select that language to satisfy this requirement. A student whose native language is not English may elect to take an examination of reading and writing proficiency in English as the tool requirement, provided significant academic material in the relevant field of study has been published in the student's native language. Arrangements for this English examination should be made with the English for International Students office.

(b) Completing a course in mathematics, statistics, or computer programming which is approved by the appropriate department and by the Graduate School; or passing a special examination covering the approved course material, administered by the appropriate department, at the level of the final examination.

(c) Completing with a grade of *B* or better a minimum of six semester hours of graduate course work in a department other than the student's major department. Three semester hours of this course work will not be counted toward the minimum semester-hour requirement of the student's degree program.

5. *The Thesis*—The main purpose of a master's thesis is to demonstrate the student's ability to make independent use of information and training, and to furnish objective evidence of constructive powers in a chosen field. The student registers for six semester hours of thesis research and must complete the thesis no later than four calendar years after the initial registration. Registration for thesis research entitles the student to the advice and direction of the member of the faculty under whom the thesis is to be written. The thesis subject must be approved by the faculty member who will be directing the thesis. The thesis, in its final form with one copy and a certificate of approval signed by the thesis director and by at least one departmental reader, must be presented to the dean no later than the date announced in the University Calendar. All theses must meet the form, style, and other requirements set forth in a pamphlet, *Information Concerning Theses and Dissertations*, available in the Office of the Dean.

6. *Master's Comprehensive Examination*—Most master's degree candidates must pass a Master's Comprehensive Examination in the major subject. Examinations are held on dates fixed by the departments, so that results can be filed in the Graduate School Office no later than the day before the faculty meets to approve the list of graduates. The nature and form of the examination is the responsibility of the department or program.

A student who fails to pass the Master's Comprehensive Examination may, in exceptional circumstances, and with the approval of the department and the dean, repeat the examination at the next scheduled examination date. If the student fails a second time, no further opportunity to take the examination is permitted.

The Doctor of Philosophy Program

The minimum requirements for the doctoral program are as follows:

1. *General Requirements*—The program leading to the degree of Doctor of Philosophy requires the satisfactory completion of a minimum of 72 semester hours of approved graduate work for entering students whose highest earned degree is a baccalaureate. A minimum of 48 of these hours must be taken in preparation for the General Examination. Entering students whose highest earned degree is a master's degree are required to register for a minimum of 48 semester hours of approved graduate work, no fewer than 24 of which must be taken in preparation for the General Examination. While completing the dissertation portion of the program, the student must register for 12 to 24 semester hours of dissertation research, depending on the number of hours completed prior to the General Examination. The exact number of semester hours required for any part of the total program is assigned by each department and may exceed the minimum required by the Graduate School.

2. *Academic Work Load*—Full-time students register for nine to 12 semester hours each semester; part-time students must register for six semester hours each semester. These requirements do not apply to students who have fewer than nine semester hours (full-time) or six semester hours (part-time) remaining to complete their programs.

3. *Transfer of Credit*—Entering students who do not hold a master's degree may request transfer of up to 24 semester hours of credit toward a doctoral degree for acceptable post-baccalaureate graduate work taken at the master's degree level at George Washington University or another accredited college or university.

4. *Tool Requirements*—As early as possible, and *before* completion of the General Examination, the tool requirements specified in the program of study must be completed. Various options are available for fulfilling the tool requirements; each department may permit certain options and not others, and all individual choices of tool options must have the approval of the student's department and of the Graduate School. Options for fulfilling tool requirements are as follows:

(a) Two foreign language reading examinations. A doctoral student whose native language is not English may not elect the native language to meet a foreign language examination requirement. However, with the approval of the department and of the Graduate School, such a student may elect to fulfill a language requirement by taking an examination of reading and writing proficiency in English, provided significant academic literature in the relevant field of study has been published in the student's native language. Arrangements for this English examination should be made with the office of the English for International Students program.

(b) High-level proficiency in one foreign language.

(c) Substitution for one foreign language reading examination of an examination, conducted by the appropriate department, in mathematics, statistics, or computer science. An examination in a graduate course at this University may satisfy this requirement.

(d) Substitution of certain graduate course work as follows: a minimum of six semester hours, completed with grades of *B* or better, in a department other than the student's major department, in place of one foreign language reading examination. Certain departments may permit options

(c) and (d) in place of both foreign language reading examinations; certain departments, as well, may permit 12 hours of graduate course work in another department to satisfy the tool requirement.

Students permitted to elect options (a) or (c) above who enter the Graduate School with a bachelor's degree must satisfy the first tool requirement before completion of 15 semester hours of course work. students entering with a master's degree must satisfy the first tool requirement no later than the second semester of registration as a candidate for the Doctor of Philosophy degree. Courses taken to fulfill the tool requirement under options (a), (b), and (c), and three of the semester hours' credit earned under option (d) (six if option (d) is permitted in place of both foreign language reading examinations) will not be counted toward the minimum semester hour requirement for the degree.

Further information regarding the various tool requirements is stated in the Graduate School's *Student Handbook*.

5. *The General Examination*—Each student is required to complete the General Examination no later than the semester following the completion of course requirements. The General Examination is composed of a written examination five to six hours in length in each of the areas of study comprising the student's total program; the time permitted between each examination is determined by the administering department. Some departments permit one or two areas of study to be "written off"; that is, a special, shorter examination is given after a year of course work in the area. A cumulative examination system is in effect in the fields of chemistry and physiology, and in the field of psychology a system of two comprehensive examinations is used. Students in these fields should consult the appropriate department for information about its system.

A student who fails to pass any part of the General Examination may, in exceptional circumstances and with the approval of the department and the dean, repeat the examination at the next scheduled examination date. If the student fails a second time, no further opportunity to take the examination is permitted.

Satisfactory performance on the General Examination is required for admission to the second stage of candidacy for the Doctor of Philosophy degree, consisting of the dissertation and final examination. Admittance to the second stage of candidacy is permitted only if the student's General Examination committee finds that the student's performance on the examination and in course work gives a good indication of success in the second stage. Passing of comprehensive examinations at the minimum level does not necessarily give this indication.

6. *The Degree of Master of Philosophy*—Upon departmental recommendation and approval of the dean, the degree of Master of Philosophy may be awarded to students who have successfully completed all requirements for the Doctor of Philosophy degree up to and including the General Examination. Not all departments recommend students for this degree.

7. *The Dissertation and Final Examination*—A dissertation is required of each doctoral candidate as evidence of ability to perform scholarly research and interpret its results. The candidate normally enrolls for *Dissertation Research* upon completion of the General Examination; however, the candidate may register for up to six semester hours of *Dissertation Research* during the time the General Examination is being completed

If the dissertation is not completed within five years from the date the General Examination is completed, the student will be required to retake the General Examination.

No later than the date specified in the University Calendar, the candidate must submit to the dean the original and one copy of the dissertation and an abstract for inclusion in the Announcement of the Final Examination and for reproduction by University Microfilms, Inc.

When the dissertation has been approved by the director and two members of the Doctoral Program Committee and filed with the dean, the candidate takes the Final Examination, an oral examination which is open to the public. A committee of examiners (composed of Graduate School faculty and, when appropriate, outside scholars) conducts the examination. A sufficient number of copies of the dissertation must be provided by the candidate for the members of the Examination Committee. If the candidate passes, he or she is recommended by the Graduate School for the degree of Doctor of Philosophy.

Detailed information regarding regulations for the form and reproduction of the dissertation is available in the Office of the Dean. The successful candidate for the doctorate is required, before receiving the degree, to pay a fee to cover the expense of printing the Announcement of the Final Examination, and for the basic service rendered by University Microfilms, Inc.

FELLOWSHIPS AND FINANCIAL AID

A limited number of graduate teaching assistantships and University Fellowships are available in most departments of instruction to students registered in the Graduate School of Arts and Sciences. A limited number of other kinds of sponsored and University awards are also available.

Students applying for admission who also wish to apply for a fellowship should submit the fellowship application and the application for admission by February 15; the necessary transcripts, Graduate Record Examination scores, and letters of recommendation should also be on file by this date. Students currently enrolled in the Graduate School should submit only the fellowship application and have current letters of recommendation on file by February 15.

Forms are available at the Office of the Graduate School of Arts and Sciences. Filing the fellowship application entitles the student to consideration for all awards available in the student's department.

Students who wish to apply for loans should indicate their intent to do so on the application for admission. Information concerning loans is contained in a booklet, *Student Financial Aid*, available from the University's Student Financial Aid Office.

COOPERATIVE PROGRAMS

The American Studies Program at George Washington University is affiliated with the American Studies Program of the Smithsonian Institution. This arrangement offers students in the field of American civilization an opportunity to take advantage of the Washington environment. Members of the staffs of the Smithsonian's American Studies Program,

Museum of History and Technology, National Portrait Gallery, and National Collection of Fine Arts offer seminars and tutorial instruction in fields which provide students with an unusual opportunity to develop new dimensions in the discipline of American civilization. This program of study is open to students working toward the degrees of Master of Arts and Doctor of Philosophy, and is intended to prepare them for research, teaching, and museum-related careers.

The Art Department of George Washington University and the Smithsonian Institution offer a joint graduate program of study and research in museum studies leading to the degree of Master of Arts in the field of Art History with a concentration in Museum Training. The Department has also established a program of study in affiliation with the Corcoran Gallery of Art, the Freer Gallery, the Hirshhorn Museum and Sculpture Garden, the Museum of African Art, the National Collection of Fine Arts, the Phillips Collection, the Renwick Gallery, and the Textile Museum. The program in Museum Studies also involves the cooperation of several departments with museums in Washington.

A program of study leading to the degree of Doctor of Philosophy in American Civilization with emphasis on library research and collections is offered jointly by George Washington University and the Library of Congress. The coordinator of the Library Program and the staff offer an orientation seminar and other courses and supervise students in reading and research and in work on such library problems as indexing, cataloguing, and bibliography.

For further information concerning these programs contact one of the following offices at George Washington University: the Graduate School of Arts and Sciences for those who are interested in any of the fields listed above, the Art Department for those interested in art museum training, the American Studies Program for those interested in the field of American civilization.

George Washington University, in cooperation with three other universities and the Folger Shakespeare Library, has established the Folger Institute for Renaissance and 18th-century Studies as a cooperative venture in graduate studies in the humanities. Seminars (limited to 12 students each) are offered each semester under the direction of American and foreign scholars. The Folger Library forms the core of the Institute. All participants enrolled in the seminars are granted access to the collections of rare books, manuscripts, and reference materials of the Library. There are also opportunities for participants to form contacts with the Fellows and readers at the Library, in the process of their research. All registered students are eligible to apply for admission to one or more of the seminars, although priority in enrollment will be accorded graduate students working on dissertations and postdoctoral scholars from the sponsoring institutions.

Further information, including a listing of seminar topics, is available in the Office of the Graduate School of Arts and Sciences or at the Folger Shakespeare Library.

The University and the National Bureau of Standards have entered into a cooperative agreement to further educational opportunity at both the University and the Bureau. This arrangement holds promise for graduate study and research, with emphasis in the physical sciences.

SPECIAL OFF-CAMPUS DEGREE PROGRAMS

The Graduate School of Arts and Sciences is currently offering the following special degree programs off campus: (1) the degree of Master of Arts in Special Studies with areas of concentration in Criminal Justice, Legislative Affairs, Social Policy, or Urban Learning, and (2) the degree of Master of Science in Special Studies with areas of concentration in Environmental Science, Social and Economic Statistics, and Telecommunication Operations.

The Graduate School has academic jurisdiction over these off-campus programs which are administered by the College of General Studies. Not all of these programs may be available in any given year. For details consult the Graduate School of Arts and Sciences.

SCHOOL OF EDUCATION AND HUMAN DEVELOPMENT

Acting Dean R.E. Baker
Acting Assistant Dean P. Botwin
Executive Assistant to the Dean L.H. Kornhauser

FACULTY*

Professors J.G. Allee, Jr., R.E. Baker, J.G. Boswell, P. Botwin, J.L. Breen, M. Brenner, F.J. Brown *(Visiting)*, M.E. Coleman, R.S. Cottrell, Jr., L.H. Elliott, R.J. Frankie, D. Hawkins, R.K. Ives, S. Kavruck *(Visiting)*, E.P. Kulawiec, D. Linkowski, A. Marinaccio, M. McIntyre, D.A. Moore, L. Nadler, M.N. Rashid, D. Smrek, J.E. Snodgrass, L.M. Stallings, R. Tillman, C.E. Vontress, L. Winkler.
Adjunct Professor D.C. Paup
Associate Professors M. Burns, A.L. Dickerson *(Research)*, J.W. Fleck, L.H. George, J.A. Greenberg, J.C. Heddesheimer, G.L. Horrworth, S.R. Paratore, R.I. Peterson, J.R. Shotel, G.W. Smith, G.D. Wiens, M.R. Withers
Assistant Professors J.R. Blank *(Research)*, M.S. Castleberry, R.N. Ianacone, N.D. Johnson, R.A. Luke *(Visiting)*, A.J. Mazur *(Research)*, H. Nashman, N.J.S. Sobel, N. Tiscione, L.A. Tsantis
Adjunct Assistant Professor J. Noel
Instructors M.B. Freund *(Research)*, A.H. Morris *(Research)*, D.C. Park *(Research)*, C.B. Stapp *(Research)*

Members of the Advanced Graduate Faculty

R.E. Baker, J.G. Boswell, P. Botwin, J.L. Breen, M. Brenner, F.J. Brown,

* The President of the University, the Vice President for Academic Affairs, the Registrar of the University, the Director of Admissions of the University, and the University Librarian are ex officio members of the Faculty of the School of Education and Human Development

M. Burns, M.S. Castleberry, R.S. Cottrell, Jr., A.L. Dickerson, L.H. Elliott, J.W. Fleck, R.J. Frankie, J.A. Greenberg, D. Hawkins, J.C. Heddesheimer, G. Horrworth, R.K. Ives, S. Kavruck, E.P. Kulawiec, D. Linkowski, A. Marinaccio, D.A. Moore, L. Nadler, S.R. Paratore, D.C. Paup, R.I. Peterson, M.N. Rashid, J.R. Shotel, D. Sinick, G.W. Smith, J.E. Snodgrass, L.M. Stallings, R. Tillman, L.A. Tsantis, C.E. Vontress, G.D. Wiggs, L. Winkler

Committees*

THE DEAN'S COUNCIL†

1977-1980: D.C. Paup, L.A. Tsantis
1978-1981: L.H. George, M. Brenner
1979-1982: J.A. Greenberg, L. Nadler

COMMITTEE ON ADMISSION AND ADVANCED STANDING‡

R.E. Baker *(Chairman)*, R. Ives, J.L. Breen, D. Linkowski, J.Y. Ruth

COMMITTEE ON SCHOLARSHIP

R.E. Baker *(Chairman)*, R. Ives, J.L. Breen, D. Linkowski

INTRODUCTION

The University began offering professional courses for teachers in 1904-05, and in 1907 it established a Division of Education. In 1909 the Division of Education became the Teachers College which in its early years was concerned largely with teacher preparation on the undergraduate level.

In 1928 the Teachers College became the School of Education and greater provision was made for advanced study. Since that time the graduate enrollment has steadily increased, with the result that today the School has a considerably larger number of graduate than undergraduate students. To reflect the current scope of its offerings, the name of the School was changed in 1977 to the School of Education and Human Development.

The School of Education and Human Development prepares teachers, resource and support personnel, and administrators for educational service. The School also offers opportunities to experienced teachers to extend and enrich their education. The programs are designed to meet the broad needs of all persons who seek the knowledge and skills necessary to provide for effective learning and teaching. The School's programs focus on the needs of persons interested in the traditional elementary and secondary school environments, but also include the preparation of individuals for all areas of education covering the life span from pre-school through the adult years in both the public and private sectors of society. The following graduate programs are representative: Generic Counseling, Adult Education, Human Resource Development, Rehabilitation Counseling, College Student Development, Higher Education, Dance, Early Child-

* The dean and the assistant dean of the School of Education and Human Development are ex officio members of all committees.

† Elected by the Faculty.

‡ Appointed by the dean.

hood Education and Early Childhood Special Education, Perceptual-Motor Development, Therapeutic Recreation, and Tourism Development and **Travel Administration.**

A Bachelor of Arts in Education is more than preparation for teaching in schools. The degree provides background and experiences for employment in a variety of public and private settings. A majority of the credit hours of required courses are in the liberal arts. In addition, the programs provide opportunities for students to develop critical thinking and reasoning, as well as leadership, organizational and planning skills. Emphasis is placed upon developing the human relationship qualities that are essential in fields that require involvement with people in all age ranges and from **all walks of life.**

The School of Education and Human Development is the administrative unit for three departments: Education, Human Kinetics and Leisure Studies, and Special Education. In addition to programs of study leading to its degrees, the School offers credit and non-credit workshops designed specifically to meet the unique needs of metropolitan area school systems, and other clients in private industry and in government.

Special curricula are tailored on an individual basis for liberal arts graduates and graduates of other professional schools who are interested in teaching or in other human services areas. The School also offers a wide range of courses for teachers who wish to renew licenses and for provisional teachers who wish to prepare for teaching certificates.

Laboratory and clinical facilities are provided by the University Reading Center and the Speech and Hearing Clinic. Field experiences are provided in cooperation with public and private schools, social agencies, museums, institutions in the business community, and community and junior colleges.

The schedule of courses is arranged to meet the convenience of both **full-time and part-time students.**

Professional Courses for Non-Education Majors

Students in Columbian College are permitted by the School of Education and Human Development to take the complete sequence of professional education courses, including student teaching in preparation for teaching in a middle or secondary school. Columbian College, however, has a limitation on the number of professional courses its students are permitted to take. Students under Columbian College policy are limited to a maximum of 12 professional credit hours; permission of the dean of Columbian College must be obtained before registration for professional courses.

The School of Education and Human Development has made extensive changes in its total curriculum. Freshmen and sophomore students are now required to take each semester a professional education course that includes field work experiences. Some of these courses make it possible for students who are undecided about their choice of a career to have an opportunity to test teaching and some of the many related helping **services areas.**

A number of professional education courses are open to non-education majors. It is recommended that students check with one of the three education departments for more specific information on courses that are open.

Education for Teaching

Programs of study in education for teaching are based upon the assump-

tion that every teacher should have a broad general education, mastery of the content of instruction, and professional competencies.

The relative emphasis placed upon each of these aspects of the total education for teaching varies in accordance with the purposes of each program. For instance, since elementary school teachers teach all subjects, they require content preparation of greater breadth and less specialization than secondary school teachers.

It is the view of the School of Education and Human Development that an acceptable minimum education for teaching requires four years of full-time study or the equivalent in part-time study. For superior preparation teachers are urged to plan for five years of full-time study or the equivalent in part-time study.

The student may choose any one of the following plans to achieve superior educational preparation for teaching:

1. Upon receiving the bachelor's degree in education, he or she may take a teaching position and, after acquiring some professional experience, return to the School for graduate study leading to the master's degree. This plan enables students with bachelor's degrees to begin their teaching careers, and to use their work experience to enhance graduate study which will follow.
2. The student may choose to pursue full-time graduate study leading to the master's degree immediately after receiving the bachelor's degree.
3. A student whose bachelor's degree is in one of the liberal arts disciplines may choose to complete the requirements for certification for teaching by studying in one of the teaching fields in a program custom-tailored to his or her particular needs.

REGULATIONS

University regulations concerning admission, registration, fees, and finances are stated on pages 20-32; other University regulations, on pages 44-52.

General Scholarship Requirements For Undergraduates

Regulations regarding academic standing, probation, suspension, withdrawals, classification of students, required placement examinations and waiving introductory courses by examination are the same as those for Columbian College; they appear on pages 69-71, 73-74, and 75-76 of this *Bulletin*.

ACADEMIC WORK LOAD

Fifteen to 17 semester hours of credit constitute a normal program. A student with a quality-point index of 3.00 or higher may, with the permission of the dean, enroll for 18 or 19 hours. No student may enroll for more than 19, except by permission of the Committee on Scholarship.

The following work load regulations apply to both graduate and undergraduate students.

Students employed 15 hours or less a week may carry a normal program of college work.

Students employed from 16 to 25 hours a week may enroll for 12 or 13 hours. Those with a quality-point index of 3.00 or higher may, with special permission of the dean,* enroll for 15 or 16 hours.

Students employed from 26 to 34 hours a week may enroll for 9 or 10 hours. Those with a quality-point index of 3.00 or higher may, with special permission of the dean,* enroll for 12 or 13 hours.

Students employed 35 hours or more a week may enroll for 6 or 7 hours. Those with a quality-point index of 3.00 or higher may, with special permission of the dean,* enroll for 9 or 10 hours.

Students who increase their hours of employment after registration or at any time during a semester must report immediately to the dean so that their programs may be adjusted, if necessary.

Graduate students employed full-time may take a maximum of 6 semester hours, unless special permission to take more is granted by the dean.*

REQUIRED PLACEMENT EXAMINATIONS

English—Students whose College Board English Composition Achievement Test scores suggest that they will benefit from more intensive training in compositional skills may be assigned to English 9 or may be tested in vocabulary, spelling, grammar, standard usage, and writing skill before placement in either Engl 9 or 10.

Foreign Languages—A student who has not been granted advanced standing and who wishes to continue in college the language begun in high school must take a placement examination in one of the following: Chinese, French, German, Greek, Hebrew, Italian, Latin, Russian, or Spanish. Upon completion of the examination, assignment is made to the appropriate course.

Mathematics—New students accepted for registration in Math 30 are required, prior to registration, to take a placement examination in algebra and trigonometry; those accepted for registration in Math 51 are required, prior to registration, to take a placement examination in algebra. (See specific mathematics requirements listed under elementary or secondary education majors.)

EARNING CREDIT BY EXAMINATION

Undergraduate students may earn semester-hour credits up to a maximum of 30 hours by performing satisfactorily on College-Level Examination Program (CLEP) Tests or special departmental examinations provided by the departments of Columbian College of Arts and Sciences on an individual basis. *Passing a waiver examination does not entitle the student to any semester hours of credit.*

Students interested in becoming certified to teach who have earned bachelor's or graduate degrees in fields other than education may satisfy some certification requirements by taking the CLEP Examinations or special departmental examinations. See pages 22-23 for general information

* Request forms are available at the office of the dean. They should be filled out and returned to the office of the dean at least two weeks prior to registration.

on the CLEP tests, and for information on special examinations offered by departments.

THE BACHELOR'S DEGREES

The School of Education and Human Development offers undergraduate programs leading to the degrees of Bachelor of Arts in Education (elementary, middle school, and secondary education, and human services) and Bachelor of Science in Human Kinetics and Leisure Studies (elementary and secondary human kinetics and leisure studies, dance education, and dance as a performing art).

Bachelor of Arts in Education

The programs leading to the degree of Bachelor of Arts in Education (elementary, middle school, and secondary education) are planned to provide (1) general educational backgrounds, (2) functional command of concepts and skills in one or more teaching fields, (3) mastery of basic professional information and skills adequate for the beginning teacher, and (4) development of attitudes needed for success in teaching or in other related human services fields.

The general educational backgrounds needed by prospective teachers or by persons interested in being employed in other human services fields are obtained through college courses, work experience, leadership activities, and off-campus cultural opportunities.

As part of formal course work, and on their own initiative, students of the School of Education and Human Development are expected to take full advantage of the many opportunities in the Washington area for developing leadership skills. Advisors are available to help students plan these experiences.

Persons preparing for teaching or for work in other human services fields require a well-rounded education. In this connection, a student completing a 126-semester-hour program in elementary education at this University will complete approximately 78 credit hours in the liberal arts; a major in secondary education will complete approximately 96 credit hours in the liberal arts. Liberal arts courses and selected professional education courses may be completed at George Washington University or may be accepted for advanced standing from another accredited institution in accordance with regulations on page 22.

Experienced registered nurses and persons engaged in related health services or other human services areas may fulfill the requirements for a B.A. in Education in the field of human services by completing 120 credit hours.

General Information for Freshmen and Sophomores

All undergraduates admitted directly to the School of Education and Human Development are assigned academic advisors at the time of admission. Advisors are designated to provide continuity of advising for students throughout their years of undergraduate study. The program for each student must be approved by a faculty advisor.

Since each student's program is defined by individual needs, it is important that students have a clear concept of their major interest in education, and that they be familiar with the certification requirements of those localities in which they expect to teach. Information on state licensing requirements is available in the Career Services Office, located in Woodhull House, 2033 G St., N.W.

Entrance Requirements for Freshmen and Sophomores

Good character and an academic background appropriate for the program of studies contemplated are required.

Requirements for admission to the freshman and/or sophomore years are as follows:

1. An acceptable certificate of graduation from an accredited secondary school, showing at least fifteen units* which must include four years of English; at least two years of one foreign language; two years of science, preferably with laboratory instruction; two years of social studies, one of which must be American history; and two years of college preparatory mathematics.

2. The principal's statement that the applicant is prepared to undertake college work.

3. College Entrance Examination Board scores submitted on the Scholastic Aptitude Test and the English Composition Achievement Test.

It is recommended that the examinations be taken in December or January of the senior year. Scores on tests taken in the junior year may be submitted. Arrangements for tests are the responsibility of the applicant and should be made with the Educational Testing Service, 20 Nassau St., Princeton, N.J. 08540; or 1947 Center St., Berkeley, Cal. 94704, not less than one month before the date of the test. In applying for the test, the applicant should specify that the scores be sent to the Office of Admissions, George Washington University, Washington, D.C. 20052.

The College Entrance Examination Board tests are preferred; however, the American College Testing battery scores will be accepted. The applicant should request that these scores be sent to the Office of Admissions directly from the American College Testing Program, Iowa City, Iowa. It is recommended that the applicant take the tests in October of the senior year.

The School of Education and Human Development will consider the adequacy of the qualifications of an applicant who, because of unusual circumstances, does not present all of the formal requirements stated above. The School may require appropriate scholastic-aptitude tests.

International students may be considered for admission with an equivalent foreign secondary certificate. A student presenting such a certificate must also show competence in the English language and may be required to enroll in a full-time program in English as a Foreign Language before beginning studies in a degree program. Requirements will be determined on the basis of an English Proficiency Test administered on-campus. A candidate who submits a score of 580 or above on the Test of English as a Foreign Language (TOEFL) may be excused from taking further course work in English as a Foreign Language.

* A unit represents a year's study in a secondary school subject, including in the aggregate not less than 120 sixty-minute periods, or the equivalent, of prepared classroom work.

Students who have been out of secondary school for three years or more and or do not meet the above requirements may take a special battery of admission tests* by contacting the Office of Admissions or may be considered for admission to the School of Education and Human Development on a conditional basis. To be admitted into the School's degree program, a conditionally admitted student must complete a trial program of 15 semester hours of course work with a quality-point index of 2.25 or higher. This trial program must include one professional course and additional courses selected from the first-year curricula of the undergraduate degree programs in Education.

The selection of courses to be taken in the trial program must be made in conference with a faculty advisor in the School of Education and Human Development. A conference concerning plans for study as a degree candidate is required of each applicant at the beginning and end of the trial program. Upon successful completion of the trial program, the student who has submitted an application for degree candidacy should ask the Admissions Office to reconsider his or her application.

Admission with Advanced Standing

Requirements for admission of students transferring from other regionally accredited colleges and universities, and from other divisions of this University, are as follows:

Students who have accumulated 15 hours or more of academic credit at another regionally accredited college or university with an acceptable program and acceptable grades may be admitted to the School of Education and Human Development. Advanced standing may be awarded for properly certified courses taken at regionally accredited colleges or universities for which the student received a grade of *C* or better, and may be applied toward a degree provided that such courses are comparable to the curricular requirements of the degree at GW.

Although a grade of *D* is not acceptable for transfer, the course may be used to satisfy a curricular requirement. Credits earned with a *D* grade may not, however, be counted toward advanced standing.

The School reserves the right to refuse credit for transfer in whole or in part or to allow credit provisionally.

It is the responsibility of the student to have an official transcript sent directly from each institution formerly attended to the Office of Admissions, George Washington University, Washington, D.C. 20052.

Students may transfer from another division of this University into a degree program in the School of Education and Human Development. The student must present an accumulated quality-point index of 2.00 or higher at the time of transfer. A student wishing to transfer into the School from another division of this University must submit a formal application of transfer to the Office of Admissions and meet other requirements for acceptance to the School.

Courses taken at another division of this University may be applied toward a degree in this School provided they are comparable to the curricular requirements of the degree.

Nurses filing for admission to the B.A. program in Human Services are

* These tests include, among others, the Differential Aptitude Test, Cooperative English Examination and Ohio Psychological Test.

required to submit a copy of their current state nurse's registration (license) in addition to the official transcripts. Nurses may be awarded advanced standing for work completed in a community or junior college program. They may also receive advanced standing up to 30 credit hours for work completed in a two-year teaching hospital program. 45 credit hours may be granted for work completed in a three-year teaching hospital program.

Students applying for transfer from another accredited college or university or from another division of this University whose previous academic records raise doubts of their ability to complete degree requirements successfully may be admitted to the School of Education and Human Development on a conditional basis. To be admitted into the School's degree program, a conditionally admitted student must complete a prescribed trial program of 15 semester hours of course work with a quality-point index of 2.25 or higher. A student registered in another division of this University who has an accumulated quality-point index of less than 2.00 and who is conditionally admitted to this School must earn a 2.25 quality-point index in the trial program and must during this trial program bring the accumulated quality point index to 2.00 or higher to be admitted to the School's degree program.

The selection of courses to be taken in the trial program must be made in conference with a faculty advisor in the School of Education and Human Development. A conference concerning plans for study as a degree candidate is required of each applicant at the beginning and end of the trial program. Upon successful completion of the trial program, the student who has submitted a degree-candidate application will be advanced to degree status.

Requirements for the Degrees

To be recommended for a degree a student must satisfy the admission, residence, scholarship, and curriculum requirements. The Bachelor of Arts in Education (elementary, middle school, and secondary education) requires 126 semester hours; the Bachelor of Arts in Education (human services) requires 120 semester hours; the Bachelor of Science in Human Kinetics and Leisure Studies (elementary secondary human kinetics and leisure studies, dance education, and dance as a performing art) requires 124 semester hours.

RESIDENCE

Candidates for the bachelor's degree must complete satisfactorily a minimum of 30 semester hours while in the School of Education and Human Development.

DEAN'S LIST

To be eligible for the Dean's List a full-time student must obtain a quality-point index of 3.5 on courses completed during the past semester. A part-time student, to be eligible, must obtain a quality-point index of 3.5 on the last 12 semester hours of course work. Such part-time students must have been enrolled for at least one three-hour course each semester, and residence during the period involved must be continuous.

SCHOLARSHIP REQUIREMENTS

For the system of grading and of computing scholarship, see pages 45–46.

In order to graduate, a student must have a quality-point index of at least 2.25. A quality-point index of at least 2.25 is required before permission is granted to do student teaching in the senior year.

Probation—A student who fails to maintain a quality-point index of at least 2.25 is placed on probation. The student remains on probation as long as the index is below 2.25, or until probation is removed by the Committee on Scholarship.

Suspension—A student on probation who fails to raise the index to 2.25 within the time specified may be suspended.

A student suspended for poor scholarship may, within 10 days, appeal the case through the dean to the Committee on Scholarship. If the case appears to be remediable and the student's scholarship seems likely to improve, the Committee may readmit the student on probation. A student denied readmission may again, after a lapse of a calendar year, petition the Committee through the dean for readmission. A student suspended twice will not be readmitted.

CURRICULUM REQUIREMENTS

In all bachelor's curricula at least 30 semester hours must consist of courses numbered above 100.

CREDIT/NO CREDIT OPTION

A junior or senior student who has a cumulative quality-point index of 2.50 or better, may, with the approval of an advisor and the dean, take one course a semester and receive a grade of *CR* (Credit) or *NC* (No Credit) which will be recorded on the student's transcript but will not be reflected in the student's quality-point index. No student will be allowed to take more than four credit no credit courses. Students must sign up for such an option at registration. Students may change from credit no credit status to graded status, or vice versa, after the end of registration only with the permission of the dean and the course instructor. Courses required in the student's major field may not be taken on the credit no credit basis. A transfer student may not choose this option until the second semester of enrollment at this University.

INCOMPLETE/AUTHORIZED WITHDRAWAL

Conditions under which the grades of *I* (Incomplete) or *W* (Authorized Withdrawal) may be assigned are described on page 45.

Removing an Incomplete—When a grade of *I* is assigned, the instructor should normally set a period within which the uncompleted work (usually the final examination or a required paper) must be made up. When required work has been completed, it is the responsibility of the instructor to change the grade of *I*, as appropriate. If work is not completed, the instructor will decide whether to change the grade of *I* to *F*, or to allow

the *I* grade to remain. The grade of *I* cannot be removed by reregistering for the course here, or by taking its equivalent elsewhere.

National Teacher Examination

The National Teacher Examination is optional for B.A. in Ed. candidates. Students who take the Examination receive individual reports of test scores and may avail themselves of the regular transcript services of the Educational Testing Service. Students should request the Testing Service to send copies of test scores to the School of Education and Human Development. Students planning to take the Examination must register for it with the Educational Testing Service. Application forms are available in the office of the dean.

Teaching-Field Programs

SUBJECT-AREA SPECIALIZATION

Subject-area specialization depends upon the teaching position for which the student is preparing. Those planning to teach in elementary schools need a degree of competency in several fields. Those preparing to teach in middle schools must acquire competency in a chosen interdisciplinary subject-matter specialization. Those preparing to teach in junior or senior high schools must demonstrate competence in a major teaching field. A minor teaching field is optional, but recommended. The student should begin teaching-field preparation during the first two years.

Teaching-field requirements for secondary education majors, developed in cooperation with appropriate departments of the University, include satisfactory completion of prescribed academic courses in one or more fields and satisfactory completion of the prescribed special methods courses. Prescribed academic courses vary in number in accordance with the scope and complexity of the teaching field and the licensing requirements of the various states.

Professional Education

The basic professional information, skills, and attitudes needed by beginning teachers are provided through a sequence of courses to be taken throughout the four years of undergraduate study. Lectures and class discussions are closely coordinated with field work. Instruction is differentiated to meet the needs of those preparing to teach on the various levels—elementary, middle, junior high, and senior high school.

The prescribed courses in special methods are concerned primarily with methods of initiating, guiding, and evaluating learning experiences dealing with the content of teaching fields. They attempt to bring to the student specific suggestions drawn from the accumulated experience of successful teachers. In addition, the courses review the teaching-field content currently in use in schools.

Education Curriculum

The following is the program for the first two years in preparation for the Bachelor of Arts in Education degree with major fields in elementary

or secondary education (including elective areas of certification in early childhood education and special education).

		Semester Hours
Education:	Educ 101, 102, 103, 104	12
English:	Engl 9 or 10; 11 or 12; 51–52, 71–72, or 191–92	12
Mathematics:	Math 9 and 10 (for elementary education majors) and two semesters chosen from Math 3, 6, 9, or 10 (for secondary education majors)	6
Science:	Three semesters (two in biological science and one in physical science or vice versa) for elementary education majors; two semesters for secondary education majors. Courses are to be chosen from BiSc 3–4 or 11–12; Chem 3–4 or 11–12; Geol 1–2; or Phys 1 and 2, or 9–10	6–9
Social Sciences:	Hist 71 or 72 and another social science course for elementary education majors: Hist 71–72 or PSc 1 and 2 or 2 and 3 for secondary majors	6
	Six semester hours selected from the following: AmCv 71–72; Anth 1–2; Econ 1–2; Geog 51 and 52; Hist 39–40; Hist 71–72; PSc 1 and 2 or 2 and 3; or Soc 1 and 2	6
Speech and Drama:	SpDr as approved; SpDr 11 or 169 for elementary education majors	3
HKLS:	For elementary education majors	3
Electives:		6–9
	Total	**60–63**

Human Kinetics and Leisure Studies Curriculum

The following is the program for the first two years in preparation for the Bachelor of Science in Human Kinetics and Leisure Studies degree with specialization in Elementary Secondary Human Kinetics and Leisure Studies. (Students should begin to acquire competency in several physical activities in the first two years).

		Semester Hours
Education:	**Educ 102 and 103**	**6**
English:	Engl 9 or 10; 11 or 12; 51–52, 71–72, or 191–92	12
HKLS:	**Four semester hours selected from first-group HKLS courses (59, 60, 61, 62 recommended); HKLS 102, 103, 111–12, 130, 139, 150, 151**	**28**
Math/Science:	**BiSc 3–4; Chem 3–4; Geol 1–2; Math 9 and 10; or Phys 1 and 2, or 9–10**	**6**
Social Sciences:	Hist 71–72, or PSc 1 and 2 or 2 and 3	6
	Six semester hours selected from one of the following combinations: AmCv 71–72; Anth 1–2; Econ 1–2; Geog 51 and 52; Hist 39–40; Hist 71–72; PSc 1 and 2; PSc 2 and 3; or Soc 1 and 2	**6**
	Total	**64**

First two years in preparation for the Bachelor of Science in Human Kinetics and Leisure Studies degree with a specialization in dance education:

		Semester Hours
English:	Engl 9, 10 or 11	6
HKLS:	HKLS 107, 108, 150, and 157	12
	Any combination of dance courses numbered 10–58, 121 or 123	6
Education:	Educ 102, 103	6
Math/Science:	BiSc 3–4; Chem 3–4; Geol 1–2; Math 9–10; Phys 1–2, or 9–10	6
Social Sciences:	Hist 71–72; or PSc 1–2	6
	AmCiv 71–72; Anth 1–2; Econ 1–2; Geog 51–52; Hist 39–40; PSc 1 or 3, 2; or Soc 1–2	6
Speech and Drama:	SpDr 1, 11, 121 or 169	3
Electives:		13
	Total	64

First two years in preparation for the Bachelor of Science in Human Kinetics and Leisure Studies degree for students interested in dance as a performing art:

		Semester Hours
English:	Engl 9, 10 or 11	6
HKLS:	HKLS 150, 157	6
	Any combination of dance courses numbered 10–58, 121 or 123	6
Humanities:	Art 21–22, 31–32; Music 1, 3 or 4; Phil 50; SpDr 45	6
Math/Science:	BiSc 3–4; Chem 3–4; Geol 1–2, 5; Math 3, 6, 9, 10; Phys 3, 4, 9, or 10	6
Social Sciences:	AmCiv 71–72; Anth 1–2; Econ 1–2; Geog 51, 52; Hist 39–40; 71–72; PSc 1 or 3, 2; Psyc 1, 5–6, 8, 22, 29; Soc 1, 2	6
Electives:		24
	Total	60

The teaching-field programs and their requirements are as follows:

Elementary Education Program

GENERAL EDUCATION REQUIREMENTS (See pages 111-12)

SUBJECT-AREA SPECIALIZATION

The requirements are three semester hours each, to be selected with approval of the advisor, of art and music survey courses* and HKLS courses; 9-12 hours of science courses† and 6 hours of social science courses, to be selected with approval of the advisor: Econ 1; Geog 51, 52; Hist 71 or 72; Math 9, 10.

---

* May be taken on a CR/NC basis.
† Must include courses in both physical and biological sciences

PROFESSIONAL COURSES

Thirty-six credit hours are required, consisting of Educ 105, 110, 111, 112, 128, 135. These courses are in addition to Educ 101, 102, 103, and 104 taken during the first two years.

Students majoring in elementary education may prepare for an additional area of certification by substituting for elective courses a sequence of courses in early childhood education or the complementary teacher program, an undergraduate special education program which prepares resource teachers to work with mainstreamed children. Consideration should also be given to taking courses that are recommended under Teaching Emphases listed on page 118.

AREA OF CERTIFICATION IN EARLY CHILDHOOD EDUCATION

Eighteen credit hours are required, consisting of Educ 132, 150, 152, 153, 154.

AREA OF CERTIFICATION IN SPECIAL EDUCATION

Twenty-four credit hours are required, consisting of SpEd 101, 102, 103, 170, 189, 190, 199.

Middle School Education Program

The middle school education program offers four teaching-field specializations together with appropriate professional training. While the importance of a thorough understanding of the nature of the middle school learner and the middle school is emphasized, equal stress is placed on early and continued direct experiences in the middle school. This experience culminates in a senior-year block instructional program conducted largely in the field.

GENERAL EDUCATION REQUIREMENTS (See pages 111-12)

SUBJECT-AREA SPECIALIZATIONS

Communications: 30 credit hours
Life Science: 30 credit hours
Earth/Space Science: 30 credit hours
Social Science: 30 credit hours

PROFESSIONAL COURSES

Thirty-six credit hours are required, consisting of Educ 105, 110, 112, 134, a special methods course selected from Educ 136, 137, 138, and 144, and electives planned with an advisor.

Secondary Education Programs

In the secondary education program a number of teaching-field specializations are offered. However, it is strongly recommended that, wherever possible, a candidate undertake the equivalent of a minor in an interdisciplinary subject area. Early counseling by the program advisor is urged to ensure a balanced and realistic program of study. The requirements in the secondary education program are as follows:

GENERAL EDUCATION REQUIREMENTS (See pages 111-12)

SUBJECT-AREA SPECIALIZATIONS

Art—42 credit hours, including Art 1 and 31-32 or 71-72, and two second- or third-group art history courses if open to undergraduates; 27 credit hours to be selected from the following: Art 21-22, 23-24, 41-42, 51-52, 57-58, 65-66, 81-82, 123-24, 125-26, 127-28, 131-32, 137, 143-44, 151-52, 153-54, 157-58, 163-64, 179-80, 181, 182, 189-90.

Biology—46 credit hours, including BiSc 11-12 and 101 or 104 or 145, 108 or 127, 128, 140, 163, 164, and two advanced botany courses as approved by the advisor; Chem 11-12; Phys 1 and 2.

Chemistry—40-44 credit hours, including Chem 11-12 or 15-16, 22, 110 or 111, 134, 151-52, 153-54, 191; Math 6, 30, 31; Phys 1 and 2.

Earth Science—49-52 credit hours, including BiSc 3-4; Chem 11-12; Geol 21-22, 101, 111, 125, 151; Math 3 and 6; Phys 1; 6-9 additional credit hours, as approved by the advisor, to be selected from the following: Anth 186; Geol 122, 128, 141, 163, 189.

English—39 credit hours, including Engl 9 or 10, 11 or 12, 52, 71-72, 101, 115, 127-28; SpDr 11; and nine credit hours to be selected from the following as approved by the advisor: Engl 117-18, 133-34, 135-36, 153-54, 155-56, 161-62, 163-64, 165-66, 167-68, 171-72, 173-74, 175-76, 177-78.

French—42 credit hours, including Fren 9, 10, 51-52 or 91-92, 103, 108, 109, 110, and two full-year second-group French literature courses; 6 semester hours from the following: Art 109, 110; Engl 115; a foreign language other than French as approved; Hist 141-42; Psyc 115.

General Science—43-45 credit hours, including BiSc 3-4; Chem 11-12 or 15-16, and 22; Phys 1 and 2 or 9-10; 10 additional credit hours in science as approved by the advisor; 9 credit hours of math to be selected from the following: Math 3, 6, 30, 31, 32, 33.

Geography—24 credit hours, including Geog 51 plus 21 credit hours to be selected from the following: Geog 104, 105, 106, 125, 127, 132, 134, 135, 140, 141, 142, 143, 145, 146, 154, 161, 198.

German—33 credit hours, including Ger 9-10, 51-52, 179-80, and 15 additional credit hours in German as approved by the advisor.

History—42 credit hours, including Hist 39-40 and 71-72; 6 credit hours of a history research seminar; 6 credit hours in each of three of the

following groups as approved by the advisor: American history, European history, history of the Eastern World, and Latin American history; 6 additional credit hours as approved by the advisor, in any one of the preceding groups.

Mathematics—39 credit hours, including Math 30, 31, 32, 33, 121, 123 or 124, 135; three additional second- or third-group mathematics courses approved by the advisor; Stat 97, 157-58.

Music—42 credit hours, including Mus 5-6, 103-4, 131-32; 6 credit hours of applied music in voice or a major instrument; 6 credit hours of applied music in minor instruments; 3 credit hours of choral or orchestral ensemble; 9 credit hours in music literature or music theory as approved by the advisor.

Physics—36 credit hours, including Math 30, 31, 32, 33; Phys 14, 15, 16, 161, 163, 164, 165, 167.

Russian—36 credit hours, including Slav 9-10, 71, 91-92, 141-42 or 151-52, 197, 198; 9 additional credit hours from the following, as approved by the advisor: Slav 101, 103, 104, 109-10, 128, 143-44, 146, 153, 156, 157, 158, 161-62, 165, 166, 172, 191, 193-94.

Social Sciences—42 credit hours, including Econ 1-2; Hist 39-40, 71-72; PSc 1 or 3 and 2; 6 credit hours to be selected from the following: Anth 1-2; Geog 51, 52; Soc 1, 2; plus 12 credit hours of second-group courses, as approved by the advisor, from anthropology, economics, geography and regional science, history, political science, and sociology.

Spanish—42 credit hours, including Span 9-10, 51-52 or 91-92, 109-10; three full-year courses selected from second-group Spanish or Spanish-American literature courses; 6 credit hours to be selected from the following: Engl 115; a foreign language other than Spanish as approved; Hist 161, 163-64, 165, 166; Psyc 115.

Speech and Drama—36 credit hours, including SpDr 1, 11, 32, 45, 49, 101, 103, 112, 121; plus 12 credit hours to be selected from speech communication or drama courses, as approved by the advisor.

PROFESSIONAL COURSES*

The requirements are 21 to 27 credit hours, consisting of Educ 105, 223 (for undergraduate credit), 112, 131, 134, and 3 to 6 credit hours selected from Educ 136, 137, 138, 139, 140, 144, 146. These courses are in addition to the following courses, usually completed during the first two years: Educ 101, 102, 103, 104.

Bachelor of Science in Human Kinetics and Leisure Studies

The program, which is designed to prepare students for teaching in elementary and secondary schools, offers opportunities for specialization in dance education and elementary or secondary school physical educa-

* A course in the teaching of reading is recommended since it is required for employment in many jurisdictions.

tion. A program is also offered in dance as a performing art for persons not interested in certification for teaching.

Prerequisite—For the first two years of the Bachelor of Science in Human Kinetics and Leisure Studies curriculums, see pages 114–15.

Specialization in Dance Education, junior and senior years—The following courses are required: Educ 104, 105, 112; HKLS 109-10, 117, 119, 133, 135-36, 141-42, 144, 150, 151, 175, 200, plus 6 credit hours of electives.

Specialization in Dance as a Performing Art, junior and senior years—The requirements consist of 10 credit hours selected from HKLS 10-58, 121, or 123; and HKLS 108, 109-10, 120, 135-36, 137 or 200, 141-42, 144, 173, 175; plus 19-21 credit hours of electives.

Specialization in Elementary/Secondary Human Kinetics and Leisure Studies, junior and senior years—Sixty credit hours are required: SpDr 1 or 11; Educ 104, 105, 112; HKLS 113, 114, 129, 138, 158, 164, 171, 133; plus 12 hours of an HKLS area of concentration and nine hours of electives.

Bachelor of Arts in Education—Program in Human Services

The program in Human Services is designed for personnel in the following human services occupations: nursing, gerontology, mental health, criminal justice, etc.

The program in Human Services is planned to: (1) enable individuals to develop their cognitive and affective abilities; (2) meet a range of human services needs; (3) develop human interaction and leadership skills; (4) facilitate entry into or advancement in human services occupations; (5) gain an awareness and appreciation for interacting values in a pluralistic society; and (6) prepare for graduate study in a professional field.

The program features a variety of fieldwork and classroom lectures, seminars, and consultation. Opportunities are provided for acquaintance with diverse human service settings and professionals in the field, and for academic concentration in departments throughout George Washington University.

Programs for students will be individually planned after an evaluation is made of previous professional and educational experiences and long-range goals.

Advanced standing may be awarded for liberal arts and specialization courses completed at accredited colleges and universities. Advanced standing will be granted for registered nurses who have completed two- or three-year programs at accredited teaching hospitals—30 credit hours for two-year programs and 45 credit hours for three-year programs. This credit includes courses completed in the sciences, but does not include other liberal arts courses.

Students will be required to complete the following liberal arts requirements for the degree, either in previous work at another institution or at George Washington University.

		Semester Hours
English:	Engl 10 and 11; 51, 71, or 191	9
Mathematics:	Math 3, 6, 9, or 10	3
Psychology:	Psyc 1	3
Science:	BiSc 3, 4; Chem 3, 4; Geol 1, 2; Phys 1, 2; Phys 9, 10	6

		Semester Hours
Social Sciences:	Hist 71–72; or PSc 1 and 2 or 2 and 3	6
Speech and Drama:	SpDr 1	3

Core courses include Educ 101, 102, 103, 104, 112, 162, 163, 176, 243, 263, and 279; and SLP 152.

Concentrations of 12 to 24 hours may be selected in adult education, dance therapy, early childhood education, human resource development, movement education, rehabilitation services, special early childhood education, vocational special education, tourism, and therapeutic recreation.

Teaching Emphases for Majors in Education and Human Kinetics and Leisure Studies

The School of Education and Human Development offers courses and programs that are educationally sound and enriching and that enhance opportunities for graduates to obtain teaching positions throughout the United States. Special teaching emphases have been developed, consisting of courses which students are encouraged to select to satisfy elective hours in their programs in elementary or secondary education.

Teaching emphases are offered in the following areas:

Guidance and Counseling	Reading
International Education	Speech Pathology and Audiology
Movement Education	Tourism

Most teaching emphases are designed to focus on areas of recognized need for elementary and secondary pupils throughout the nation, particularly those in large urban centers. Graduates of these programs, with their added skills and understandings in these critical areas, should be attractive candidates for teaching positions.

A field that has experienced significant growth, both nationally and internationally, is tourism. The academic advisor in tourism will try to assist students who select this sequence to find part-time work in travel agencies and bureaus to enhance classroom experience.

Many of the courses offered in the teaching emphases have been taken directly from master's degree programs of the School of Education and Human Development and assigned undergraduate numbers.

Students interested in more detailed information about these sequences are encouraged to contact the Dean's Office, School of Education and Human Development, or their academic advisors.

The following represents a breakdown of the specific courses offered in each of the teaching emphases:

Guidance and Counseling: Educ 161, 162, and 163.

International Education: Educ 171, 172, and 173.

Movement Education: HKLS 101, 102, 113, 129, and 130.

Reading: Educ 100, 110, and 111.

Speech Pathology and Audiology: SpDr 1, 101, 103, 104, 108, 118, 119, and Psyc 115.

Tourism: HKLS 104, 113, and 184.



GRADUATE STUDY

The School of Education and Human Development offers graduate programs leading to the degrees of Master of Arts in Teaching, Master of Arts in Education, Education Specialist, and Doctor of Education.

GRADES

For graduate work, grades are indicated as *A*, Excellent; *B*, Good; *C*, Minimum Pass; *F*, Fail; *I*, Incomplete; *W*, Authorized Withdrawal; *CR*, Credit. Grades *A*, *B*, *C*, and *F* are counted in computing the quality-point index (see page 45).

Whenever a grade has not been assigned, the symbol *I* (Incomplete) or the symbol *W* (Authorized Withdrawal) will be recorded. The symbol *I* indicates that a satisfactory explanation has been given to the instructor for the student's failure to complete the required work of the course. An instructor recording a grade of *I* will normally stipulate a date by which work must be completed. The instructor has the responsibility for changing the grade of *I* to an appropriate grade upon completion of work or, if work is not completed by the stipulated date, determining whether the grade of *I* should be changed to *F* or allowed to remain in the record.

THE DEGREE OF MASTER OF ARTS IN TEACHING

The School of Education and Human Development offers an intensive, interdisciplinary fifth year in museum education. This program is designed to prepare selected liberal arts graduates, postgraduates, and professionals for education work in a museum or for liaison work between museums and school systems. Students receive the degree of Master of Arts in Teaching upon completion of the program.

For details write the chairman of the Department of Education, M.A.T. Program, School of Education and Human Development, George Washington University, Washington, D.C. 20052.

ADMISSION

To be admitted to the program in museum education an applicant must (1) have a bachelor's degree from an accredited institution; (2) submit three written references attesting to quality of academic record and work experience; and (3) be interviewed by the University Selection Committee or make alternative arrangements specified by the Committee and approved by the dean of the School of Education and Human Development. Considered essential are skills in communication, a desire to study and learn from the artifacts of nature and civilization, and an ability for and interest in working with people. Evidence of strong undergraduate, graduate, or professional experience in such fields as American history, geology, art, or the social sciences will be considered favorably.

THE STUDY FOR THE MUSEUM EDUCATION PROGRAM

The program begins with a six-week summer session. Emphasis is on the

study of museums and communication skills. During the fall semester students study the school as an institution—its organization, pupil population, staff and services—and as a laboratory, where they will work in classrooms with students and teachers. The program will also focus on other museum audiences. Students will earn at least 12 semester hours of credit in an academic concentration. During the spring semester students will have an internship in area science, art or history museums.

THE DEGREE OF MASTER OF ARTS IN EDUCATION

Programs of study leading to the degree of Master of Arts in Education are designed to enable prospective teachers and experienced teachers to increase their professional and academic knowledge and skills and to prepare for special types of educational service. They also provide opportunities for college graduates in other disciplines to acquire needed professional education, as well as study in the subjects which are directly related to their professional objectives.

Master's programs are available in the fields listed on the following pages.

Adaptive Physical Education

The primary goal of the adaptive physical education degree program is to make a contribution toward alleviating the shortage of trained personnel in physical education for handicapped persons. The program also serves to retrain physical educators for new roles in public school systems and developmental and rehabilitation settings. The program focuses upon the adaptive physical educator as part of the comprehensive treatment team; therefore a multidisciplinary approach is emphasized.

Adult Education

The program of study in the field of adult education prepares students for positions in educational institutions, voluntary organizations, and other institutions in the private or public sectors which sponsor adult learning programs. The students enrolled in this program obtain the skills and understandings required to perform functions associated with the roles of learning specialist, administrator, counselor, and consultant in the field of adult education.

College Student Development

The master's degree program in college student development provides the academic, professional, and philosophical preparation for entry-level positions in the field of student affairs. The program provides education in administration, counseling, group facilitation, leadership training, and organizational development. Many graduates are employed in colleges and universities in the areas of career development, international student advising, residence hall programming, financial aid, student affairs research, student activities, admissions, and counseling.

Curriculum

The master's degree program in curriculum has been developed to assist educators in meeting state licensing requirements for school administration and supervision. Courses cover a broad range of theory and practice and are appropriate for non-school-based agencies and for educators concerned with program or learning media development.

Dance

The master's degree program in dance is designed to prepare dance specialists for roles in the areas of choreography, therapeutic dance, dance education, performance, or for specific areas of specialization for graduate study, history, research. The student plans with the advisor a course of study that considers individual background, professional interests, and career goals.

Early Childhood Education

The master's degree program in early childhood education prepares teachers, directors, and supervisors in nursery schools, day care centers, and kindergartens, as well as researchers and program specialists in the field.

Elementary Education

The master's degree program in elementary education is planned to help teachers continue their professional growth and advance in competence in their work in regular elementary school classrooms. The program may be used to develop an academic specialization for work with elementary school children, or to explore fields of specialization for present or future professional goals.

Elementary/Secondary Administration

The graduate program in educational administration is designed to prepare students for leadership roles in public and private educational organizations. The master's degree program in elementary and secondary administration is considered to provide the minimum entry-level preparation for the positions of principal, assistant principal, and head of department.

General Physical Education

This program permits students to take courses in allied areas and cognate fields to enhance their ability to compete for more varied employment opportunities in general physical education. The electives are planned by the student in consultation with the advisor and are based on background and professional goals.

Generic Counseling

The generic counseling program prepares individuals to do vocational, educational, or personal counseling in community or governmental agencies.

Guidance and Counseling

The guidance and counseling program prepares individuals to be certified to work as counselors in elementary or secondary schools.

Higher Education

The higher education program affords the student a concentration in administration, teaching, or curriculum. Courses prepare students for administrative positions in areas generally encompassing college and university organizations: academic affairs, public relations, finance, and development.

Human Resource Development

The program of study in the field of human resource development is designed for persons either entering or advancing in positions associated

with training, education, and development activities in business, industry, government, and other large organizations in the public or private sectors. The program prepares students with the skills and understandings needed for responsibilities as learning specialists, administrators, and consultants in this field.

Individualized Master of Arts

This program permits development of individualized programs which cut across existing fields, both within the School of Education and Human Development and between Education and other schools and departments of the University and Consortium. The program is designed to meet specific professional objectives of applicants with unique needs. It will be possible to relate independent study, special workshops, international experiences, and a thesis to identified objectives. There must be a balance between foundational and specialty preparation and between theoretical and practical experiences.

Perceptual-Motor Development

The purpose of this program is to assist the student in developing the ability to observe performance, analyze tasks, assess developmental level, prescribe appropriate activities, and apply appropriate learning strategies. Graduates are now working as motor development specialists and team members in special education settings, resource personnel for mainstreaming, curriculum specialists in movement education and perceptual-motor development, and activity coordinators in public and private day care centers.

Reading

Teachers who have completed this program have been employed in various school systems, as special reading teachers, reading clinicians, reading consultants, or reading supervisors. Persons who complete the program (or courses selected from it) will be more attractive candidates for regular classroom teaching positions, in addition to being more effective teachers.

Rehabilitation Counseling

This program prepares individuals to provide vocational counseling and psychosocial services to people confronted by problems of physical, emotional, intellectual, or social disabilities. Employment opportunities for trained counselors exist in state vocational rehabilitation agencies and community agencies such as sheltered workshops, rehabilitation centers, and mental health settings. The rehabilitation counselor functions mainly as a counselor but also as a coordinator of services provided.

Secondary Education

This program is designed primarily for junior and senior high school teachers who wish to further develop their skills and competencies in teaching. The program is also useful to those interested in learning about secondary schooling in the United States.

Special Education

Early Childhood Special Education

The early childhood special education program consists of 39 semester hours of graduate credit designed to bring students insight and knowledge

in the areas of the development of young exceptional children; handicapping conditions of early childhood; identification and assessment procedures in early childhood special education; clinical teaching of developmentally disabled young children; and alternative models of service to the developmentally disabled young child. This two-pronged program prepares teachers of developmentally disabled young children (a direct service role), and early childhood special education strategists (a consultant role). Admission requirements differ for each role. Eligibility for this program is best determined by a personal interview with the program staff.

Vocational/Special Education Program

This program is designed to provide trained personnel to assist the handicapped to become self-sufficient in an increasingly complex society. The emphasis of the program has been placed on career training in order to assist the handicapped person to obtain a constructive place in the working community. The student receives intensive training in assessment, individual educational planning, pre-vocational education, supportive-vocational education, academic programs, and community placement. A graduate of this program will be prepared to be either a *classroom-based* teacher in a secondary-level school, serving as a work-study coordinator or special education classroom teacher, or a *school-based* resource teacher.

Supervision and Human Relations

The program in supervision and human relations prepares persons for administrative and supervisory positions in public and private schools and school districts. The program is designed to lead toward licensing for administrative and supervisory positions in nearby states. Basic courses relate to general supervisory principles and responsibilities, and will also be of interest to educators in non-school agencies.

Therapeutic Recreation

The program prepares students for positions in therapeutic recreation in hospitals, institutions, day care centers, geriatric facilities, community recreation departments, and other facilities which provide services to special populations. At least seven roles have been identified in the field of therapeutic recreation; these include therapist, counselor, educator, supervisor, administrator, researcher, and consultant.

Tourism Development and Travel Administration

The program has an emphasis that is international in scope; it is concerned with public travel and tourism offices, convention and visitor bureaus, research and planning firms, financial institutions, tour wholesalers, travel agencies, educational institutions, and corporations involved in travel and tourism. The program is intended for those concerned with developing competencies needed for advancement in tourism and travel organizations, and with preparing entry-level professionals for placement. Graduates are now employed by travel-related businesses, colleges and universities, national tourism agencies, resorts, and in other travel/tourism organizations.

For teachers interested in developing or strengthening their academic competence, the Master's programs in elementary and secondary education

normally permit 15 to 18 semester hours of work in departments other than education. These programs are designed to meet the need of teachers-in-service who need additional work in content to qualify for advanced certification or to improve their classroom skills and may also be helpful to previously trained teachers planning to re-enter the profession. The major emphasis is upon strengthening both the academic and professional competencies of the teacher.

Additional information concerning these programs may be obtained by writing or telephoning the office of the dean.

ENTRANCE REQUIREMENTS FOR THE MASTER OF ARTS IN EDUCATION

A bachelor's degree from an accredited institution, an undergraduate quality-point index of 2.50 or above [C+ average], demonstrated interest in teaching, and personality traits that give promise of success as a professional educator, are required. Students whose quality-point index is in the range of 2.3 to 2.49 will be considered for provisional admission. The quality-point index is computed on the basis of the last two years of the bachelor's degree program and on all course work completed beyond the baccalaureate. In a number of programs there are more applicants than can be accepted; therefore, selections by additional criteria may be necessary.

Two years of successful teaching are required before admission to candidacy in the field of school administration. Experience may be required for admission to programs in adult education and human resource development.

Candidates whose undergraduate preparation does not include equivalents of the basic requirements for the degree of Bachelor of Arts in Education must make up deficiencies and may be required to take designated tests.

An interview in the office of the dean is required for applicants who live in the Washington, D. C., metropolitan area; a letter of reference is required of all other applicants.

ADVANCED STANDING

Advanced standing is granted for approved courses taken at other accredited institutions, but a minimum of 24 semester hours must be completed at this University as a master's candidate.

A maximum of 12 semester hours of advanced courses completed in this University in excess of the requirements for the bachelor's degree may be credited toward the master's degree if the work fits in with the student's plan of specialization.

Advanced standing is not granted for work completed five or more years before application for admission or readmission to master's candidacy.

PLAN OF STUDY

The plan of study leading to the degree of Master of Arts in Education requires a minimum of 33 hours of graduate credit. The plan may, at the student's option, include a thesis carrying six hours of graduate credit.

Whether or not a student selects the thesis option, a minimum of 18 hours must be from courses planned primarily for graduate students (third-group courses). The 18 hours must include a course in research methods and procedures. A minimum of 12 hours, not including the thesis or the research course, must be from courses offered by the School of Education and Human Development.

Programs may include additional teaching field preparation. In such cases, however, undergraduate and graduate courses combined must be at least equivalent to the undergraduate requirements for the degree of Bachelor of Arts in Education.

Programs are planned initially in conference with an admission advisor in the School of Education and Human Development and subsequently with a designated advisor in the candidate's area of specialization. These programs are based on the candidate's interests and background and on the certification requirements of the state and locality in which the candidate plans to teach.

All degree requirements must be completed within six years.

RESIDENCE

A candidate for the master's degree is required to complete satisfactorily 24 semester hours in residence

SCHOLARSHIP

A quality-point index of 3.00 is required for graduation. Students who receive the grade of *C* in more than six semester hours are subject to suspension. Students who receive a grade of *F* must confer with the dean before enrollment for further work.

THE THESIS

The choice of the thesis subject must be approved in writing by the student's advisor and filed in the office of the dean. A statement of the School of Education and Human Development standards for the thesis and printed copies of detailed regulations regarding the form and reproduction of the thesis are available in the office of the dean.

Payment of tuition for the thesis course entitles the candidate, during the period of registration, to the advice and direction of the member of the faculty under whom the thesis is to be written. In case a thesis is unfinished, additional time may be granted. The student must, however, be enrolled continuously in the program. If the preparation of the thesis extends beyond the additional time granted, the student must register for the entire six hours of thesis again and pay tuition as for a repeated course.

MASTER'S COMPREHENSIVE EXAMINATION

Candidates in M.A. programs requiring 33 semester hours may, with the approval of their academic advisors, elect to take an additional three-

semester-hour course in lieu of a comprehensive examination. Candidates in programs whose basic requirements exceed 50 semester hours may waive the comprehensive examination with approval of the academic advisor. Candidates who plan to take the examination must be registered for the semester it is to be taken and must file a written application in the office of the School of Education and Human Development no later than 30 days prior to the date of the examination. Comprehensive examinations are required of students in Early Childhood Education, College Student Development, Reading, and all programs in Human Kinetics and Leisure Studies.

THE DEGREE OF EDUCATION SPECIALIST

The program of advanced study leading to the degree of Education Specialist is for students with master's degrees in education who seek further professional preparation for specific objectives.

Education specialist programs are available in the fields of administration, adult education, counseling, curriculum, higher education, and human resource development.

Entrance Requirements

The degree of Master of Arts in Education, or grades in graduate course work which meet standards set by the Advanced Graduate Faculty, and two years of successful pertinent experience are required. A satisfactory score on the Miller Analogies Test or the Graduate Record Examination is also required.

Each applicant must be interviewed and recommended by a staff member of the School of Education and Human Development or by a representative in the candidate's locality appointed by the dean.

Scholarship

Scholarship requirements for the degree of Education Specialist are the same as those for the degree of Master of Arts in Education (see page 125).

Programs of Study and Degree Requirements

Individual programs are developed through the faculty-advisor plan, to fit the candidate's skills, interests, and career goals. A minimum of 30 semester hours beyond the requirements of the degree of Master of Arts in Education is required. At least 24 hours of this work must be taken on campus at this University; with the approval of the advisor, the remaining semester hours of the program may be taken in off-campus offerings of the GWU College of General Studies or at another approved university. A maximum of five calendar years is allowed for completion of the program.

At least 12 of the required 30 hours must be in appropriate graduate courses in education selected from the following areas: (1) foundations and cognate study, (2) background and general principles of the field of study, (3) an area of specialization.

The Comprehensive Examination

Successful completion of a six-hour written examination and/or an oral examination, at the option of the major field advisor, is required.

THE DEGREE OF DOCTOR OF EDUCATION

The School of Education and Human Development offers programs of advanced study leading to the degree of Doctor of Education. These programs, which are under the supervision of the Advanced Graduate Faculty, provide major fields of study in teacher education, special education, counseling, administration and curriculum, adult education, human development, human resource development, and higher education. Supporting fields are available in administration, administration of higher education, adult education, college student development, counseling, curriculum, elementary education, higher education, human growth and development, human resource development, international education, reading, secondary education, special education, supervision, teacher education, and tourism development and travel administration. With the approval of the Advanced Graduate Faculty and the departments concerned, one supporting field may be taken in other departments of the University. All programs require study of interrelated areas of education and a doctoral dissertation in the major field of study.

Admission

The applicant must have adequate preparation for advanced study, including graduate work in fields prerequisite to his or her objective, equivalent to that required for the degree of Master of Arts in Education at this University, at least three years of successful pertinent educational experience, acceptable personal qualities, and a capacity for creative scholarship and effective leadership.

The applicant first arranges for an interview with the assistant dean to explore the applicant's needs in relation to the resources of the School and to guide the student in applying for doctoral study. The required procedures and standards will be explained at this time. Candidates meeting the initial standards are admitted to precandidacy for the degree.

PRECANDIDACY

In the precandidacy period a minimum of nine semester hours of course work in the program, including requirements specified by the Advanced Graduate Faculty, must be completed. This work must be completed within three semesters of admission to precandidacy, for part-time students, or within the first 18 semester hours of course work for full-time students. Application for full candidacy will then be decided on the basis of the quality of scholarship in the precandidacy period, the recommendations of instructors, a detailed plan for the balance of the program, and a qualifying examination.

Plan of Study

In general, from two to three years of full-time study beyond the degree

of Master of Arts in Education, or the equivalent in part-time study, are required. Programs are individually planned. It is estimated that, for the average student, the work required for the total program will be 75 semester hours, including a minimum of 12 semester hours of dissertation research.

Each program is divided into two parts. The first consists of preparation for comprehensive examinations in a major field of study and two supporting fields, and completion of a required research tool field. The second is composed of research investigation, the writing of a dissertation, and the final oral examination.

Students who have completed the comprehensive examinations must register for a minimum of six semester hours of *Dissertation Research* (Educ 491) per semester until 12 hours have been completed, and a minimum of three semester hours a semester thereafter until the satisfactory completion of the final examination.

COMPREHENSIVE EXAMINATIONS

Upon admission to doctoral candidacy the student is assigned to a committee, each member of which is responsible for guiding the preparation for one of the required comprehensive examinations in supporting fields or the major field comprehensive examination. The candidate must arrange individual conferences with the committee members to determine the content of each field and to receive guidance in preparation for the examination.

The supporting field examinations, which are taken first, are three-hour written examinations. In addition to the research tool field a student who plans a historical research investigation for the dissertation must complete an appropriate research seminar offered by the Department of History. The student's dissertation committee may recommend other tool requirements. The tool requirement must be completed prior to the major field examination. The major field examination is a written 12-hour examination, six hours on each of two successive days.

The candidate begins the second part of the program after the satisfactory completion of all supporting field examinations, the required research tool field and the major field examination.

THE DISSERTATION

A dissertation is required as evidence of ability to perform scholarly research and to interpret and present its results.

During the first part of the program, the dean appoints a dissertation committee, consisting of a chairperson (usually a major field advisor) and two additional faculty members who serve as readers. The candidate is required to submit a proposal for the dissertation to this committee, which determines its acceptability and recommends approval to the Committee on Advanced Graduate Studies. The dissertation is completed under the guidance of the chairperson, with the advice of the other members of the dissertation committee.

No later than the date specified in the calendar, the candidate must submit to the dean five complete copies of the dissertation and two copies

of an abstract for inclusion in the announcement of the examination and for reproduction by University Microfilms, Inc. Printed copies of detailed regulations regarding the form and reproduction of the dissertation, preparation of the abstract, and services offered by University Microfilms, Inc., are available in the office of the dean. The successful candidate for the doctorate is required, before receiving the degree, to pay a fee to cover the expense of printing the Announcement of the Final Examination and to cover the basic service rendered by University Microfilms, Inc., and to sign a microfilm agreement.

THE FINAL EXAMINATION

When the dissertation has approval of the director, the candidate is recommended to the dean for the final oral examination, which must be passed at least three weeks before the degree is to be conferred. The examination is open to the public and is conducted by a committee of the faculty, appointed by the dean, supplemented by at least two leaders in the candidate's field of study from outside the University. Candidates who successfully pass the oral examination are recommended for the degree by the faculty of the School of Education and Human Development.

Residence and Continuous Study

All the preparation for the degree, including examinations, courses, seminars, and other work done under the direction of an advisor, must be done in residence. The student must be continuously enrolled in the School of Education and Human Development, unless the dean or the Advanced Graduate Faculty grants a leave of absence. Failure to register each semester of the academic year may result in lapse of candidacy. Subsequent readmission is subject to whatever new conditions and regulations have been established by the Advanced Graduate Faculty.

The supporting and major field examinations must be completed within five years of the date of admission, and the entire program must be completed within eight years, regardless of full-time or part-time study. All candidates must satisfy one of three options for full-time study. Information concerning these plans will be provided by the assistant dean upon request by the candidate.

SPECIAL PROGRAMS AND SERVICES

Education of Teachers of Exceptional Children

The School of Education and Human Development offers a program for the education of teachers of exceptional children. Laboratory experiences are arranged in schools for handicapped children in the metropolitan area. Students are accepted at the junior- or senior-year undergraduate, master's, education specialist, and doctoral levels. By special permission, teachers, school administrators, and adequately prepared students from other schools and colleges of the University may elect these courses. Inquiries concerning the program and the availability of scholarships and fellowships should be directed to Dr. Rita Ives, Department of Special Education, George Washington University, Washington, D.C. 20052.

Graduate Program in Rehabilitation Counseling

This federally funded master's degree program trains rehabilitation counselors to assist those who are disabled or disadvantaged to assume a place in society. The two-year program combines fieldwork and coursework in preparing students for employment in an expanding field that yields high humanitarian rewards. Both the profession and the program are interdisciplinary, drawing upon such related areas as guidance, medicine, psychology, social work, sociology, and special education.

Inquiries concerning the program, the availability of traineeships for full-time students and applications should be directed to Dr. Daniel Sinick, Rehabilitation Counselor Education, George Washington University, Washington, D.C. 20052.

Graduate Specialization in Therapeutic Recreation and Adaptive Physical Education

This master's degree program in the field of physical education, with a specialization in therapeutic recreation or adaptive physical education, is funded by the Bureau of Education for the Handicapped, U.S. Office of Education. Both programs require an intensive internship (minimum of 510 clock hours) in University affiliated training centers in Washington area hospitals, schools, clubs, and public agencies. Inquiries concerning this program and the availability of graduate research assistantships and traineeships should be directed to the Chairman, Department of Human Kinetics and Leisure Studies, George Washington University, Washington, D.C. 20052.

Therapeutic Recreation Technician Certificate Program

The Department of Human Kinetics and Leisure Studies offers a certificate program in therapeutic recreation. This preservice curriculum prepares professional personnel to work in a variety of settings, such as community recreation, state institutions, correctional facilities, and nursing homes. The curriculum emphasizes the therapeutic recreation process and activity leadership skills; students who complete the program will qualify for professional registration with the National Therapeutic Recreation Society; students in the Upward Bound Program may participate in this program as an area of concentration in therapeutic recreation. Inquiries should be addressed to Ms. Andrea Moore, Department of Human Kinetics and Leisure Studies, George Washington University, Washington, D.C. 20052.

Certification Curricula

The School of Education and Human Development provides individually planned programs for liberal arts graduates with appropriate degrees from accredited institutions who wish to prepare for teaching. These students (certification fast run) wishing to work for a degree may enroll in a regular graduate program if they meet the admission, scholarship, and personality requirements of degree candidates. The School also provides a wide range of courses of interest to teachers who wish to renew licenses.

Reading Center

[See pages 53-54]

Speech and Hearing Clinic

[See page 53]

Off-Campus Degree Programs

The School of Education and Human Development has academic jurisdiction over the off-campus programs leading to the degree of Master of Arts in Education in the fields of elementary education; generic counseling; guidance and counseling; higher education; human resource development; reading; secondary education; special education—early childhood special education and vocational special education; and supervision and human relations. The degree of Education Specialist is offered in administration and higher education.

These degree programs are administered by the College of General Studies. For details concerning the off-campus programs see the *College of General Studies Bulletin*.

SCHOOL OF GOVERNMENT AND BUSINESS ADMINISTRATION

Dean N.M. Loeser
Associate Dean **L. Gintzig**
Assistant Deans **D.F. Bergwall, J. Lobuts, Jr.**

FACULTY*

Professors F. Amling, G. Black, D.S. Brown, B. Burdetsky, S.R. Chitwood, K.J. Darr, M.C. Devolites, S.F. Divita, R.B. Easton, A. El-Ansary, R.F. Ericson, L. Gintzig, P.D. Grub, J. Harvey, W.J. Keegan, F.C. Kurtz, G.P. Latiker, E.J.B. Lewis, G.L. Lippitt, N.M. Loeser, A.J. Mastro, D.C. McGrath, Jr., H.R. Page, C.M. Paik, P.N. Reeves, D.D. Roman, E. Timbers, P.B. Vaill, J. Zwick
Adjunct Professor P.D. Nelson
Associate Professors E.B. Adams, P.S. Birnbaum, B.L. Catron, J.P. Coyne, H.J. Davis, R.F. Dyer, R. Eldridge, E.H. Forman, S.S. Fuller, M.G. Gallagher, S. Greene, W.C. Handorf, W.W. Hardgrave, M.M. Harmon, R.L. Hand, E.L. Hullander (*Visiting*), P.B. Malone III, J.F. McCarthy, Jr., A.E.

* The President of the University, the Vice President for Academic Affairs, the Registrar of the University, the Director of Admissions of the University and the University Librarian are ex officio members of the faculty of the School of Government and Business Administration.

Merget, C.R. Miller, O.L. Quintana, D.O. Porter, T.E. Shaughnessy, S.N. Sherman, R.G. Shouldice, W.E. Smith, C.J. Testa, S.J. Tolchin, C.W. Washington, E.K. Winslow

Adjunct Associate Professors W.J. Auton, J. Lobuts, Jr., J.N. Pearce

Assistant Professors T.M. Barnhill, D.F. Bergwall, G. Bodnar, D. Gale, E.W. Hahn, J.J. Jones, S.D. Lind *(Visiting)*, G.J. McHugh, J.M. Sachlis, S. Umpleby, P. Welling

Adjunct Assistant Professors P.T. Bruder, H.C. Coffey, D.F. Eversmann, M. Meyer, J.E. Montgomery, N.G. Oglesby, C.B. Smiley, Jr.

Instructors C.P. McKelvey, M.L. Slagle *(Visiting)*

Adjunct Instructors C.A. Allen, G.E. Farrelly, R.P. Hill, J.P. Kelly, A.C. Riley, W.L. Roach, Jr., D.R. Sheldon

Committees*

DEAN'S COUNCIL

S. Greene, E.W. Hahn, W.C. Handorf, F.C. Kurtz, G.J. McHugh, C.W. Washington

COMMITTEE ON CURRICULUM AND PROGRAMS

E.H. Forman, D.E. Gale, M.G. Gallagher, A.E. Merget, S.N. Sherman, R.G. Shouldice

COMMITTEE ON DOCTORAL STUDIES

G.P. Lauter, B. Burdetsky, S.R. Chitwood, S.S. Fuller, W.W. Hardgrave, A.J. Mastro, P.N. Reeves

COMMITTEE ON MASTER'S STUDIES

G.H. Bodnar, R.F. Dyer, L. Gintzig, J.F. Lobuts, D.C. McGrath, Jr., D.O. Porter, P.B. Vaill

COMMITTEE ON UNDERGRADUATE STUDIES

D.F. Bergwall, J.P. Coyne, A.I. El Ansary, C.M. Paik, J.Y. Ruth

INTRODUCTION

This School was organized as the School of Government in 1928. During the next two decades, programs in business administration and public administration were added, and the emphasis gradually shifted from undergraduate to graduate study. The name was changed in 1960 to the School of Government, Business, and International Affairs to reflect more accurately the offerings of the School. A division of the School was effected in 1966, and two schools were established—the School of Government and Business Administration, a primarily professionally oriented school; and

* The Dean of the School is an ex *officio* member of all committees.

the School of Public and International Affairs, a primarily policy-oriented school.

Objectives

The objectives of the School are:

1. to prepare graduates for positions in the management of complex organizations in both business and government;
2. to emphasize a broad fundamental education as the best preparation for positions carrying management or administrative responsibility;
3. to explore in all their forms, through education and research, the interactions and interdependencies of institutions in the public and private sectors, both nationally and internationally;
4. to extend the School's resources and influence into the "community", that is, to business, educational, health, and governmental institutions in its environment whose missions and needs can benefit from access to the School's resources.

Programs in the School include examination of administrative principles and quantitative approaches to decision-making common to both business and government. These programs stress the points at which major policy decisions of either business or government must give consideration to related policy decisions of the other. Emphasis is placed on the fact that management education is not limited to organizational techniques but is, in the broadest sense, education for management responsibility.

It is the policy of the School to emphasize a broad fundamental education as the best preparation for positions carrying management or administrative responsibility.

Undergraduate programs concentrate the first two years in a broad liberal arts curriculum drawn fom the social sciences, humanities, quantitative methods, and a limited number of courses in administration. Students in the junior and senior years expand their work to include (1) the functions of business enterprise, (2) the economic and legal environment of business, (3) the implications of modern analytical techniques based on quantitative methods, (4) the study of organization theory and human relations, and (5) the practice of problem-solving techniques.

Graduate programs develop the elements common to all management positions regardless of the nature of the operation. Master's degree programs are based on study of the principles of management, human relations and problem-solving plus an area of specialization.

The student body is comprised of both full- and part-time students, which necessitates the scheduling of classes both during the day and in evenings after normal working hours. All students should anticipate some evening classes. The presence of working students is viewed as an enrichment of the evening class sessions.

Academic Status

The School of Government and Business Administration has maintained full membership in the Middle Atlantic Association of Colleges of Business Administration since 1961. It joined the Council on Graduate Education for Public Administration in 1966. In 1968, the School became a member of the American Assembly of Collegiate Schools of Business, and the undergraduate programs are accredited by the Assembly. The programs

in accounting satisfy the educational requirements for the Certified Public Accountant and Certified Management Accountant professional examinations. The program in health care administration is accredited by the Accrediting Commission on Education for Health Services Administration. The Master of Urban and Regional Planning degree program is recognized by the American Institute of Planners.

Common Body of Knowledge

Programs leading to the degrees of Bachelor of Business Administration and Master of Business Administration include the equivalent of at least one year of work in the following areas:

1. a background of the concepts, processes, and institutions in the production and marketing of goods and/or services and the financing of the business enterprise or other forms of organization;
2. a background of the economic and legal environment as it pertains to profit and/or nonprofit organizations, along with ethical considerations and social and political influences as they affect such organizations;
3. a basic understanding of the concepts and applications of accounting, quantitative methods, and information systems;
4. a study of organization theory, behavior, and interpersonal communications;
5. a study of administrative processes under conditions of uncertainty, including integrating analysis and policy determination of the overall management level.

Fellowships

The School of Government and Business Administration has several graduate fellowships available to its students, including the Aryamehr Research Fellowships in International Business, Health Care Administration Fellowships, Ernst and Ernst Grant to Doctoral Candidates in Business or Economics, the National Association of Purchasing Management Fellowship, the Scottish Rite Foundation Fellowships, and the Wolcott Foundation Scholarships.

REGULATIONS

Regulations concerning admission, registration, fees and finances are stated on pages 20-32; other University regulations, on pages 44-52.

Attendance

A student may not attend classes until registration is completed and fees due are paid. A student may be dropped from any course for undue absence.

The student is held responsible for all the work of the courses in which registered, and all absences must be excused by the instructor in charge before provision is made for the student to make up the work missed.

A student suspended for any cause may not attend classes during the period of suspension.



Withdrawal

Withdrawal from a course or from the University without academic penalty is permitted during the first five weeks after registration for the fall or spring semester. Withdrawal after this period is permitted only in unusual circumstances, and requires certification by the instructors of courses for which the student is registered that the student is doing passing work (see "Withdrawal," page 46).

Adding Courses

Courses may not be added after the first two weeks of classes in any semester.

Independent Study Plan

A student of *demonstrated capacity*, with a special interest in the subject matter of a course, may be permitted to undertake study under the personal direction of an instructor, in accordance with the rules of the appropriate department. Credit under this plan is limited to the specific course credits normally allowed when taken on a class basis.

Use of Correct English

Any student whose written or spoken English in any course is unsatisfactory may be reported by the instructor to the dean. The dean may assign supplementary work, without academic credit, varying in amount with the needs of the student. If the work prescribed is equivalent to a course, the regular tuition fee is charged. The granting of a degree may be delayed for failure to make up such deficiency in English to the satisfaction of the dean.

THE BACHELOR OF BUSINESS ADMINISTRATION DEGREE

The School offers programs leading to the degree of Bachelor of Business Administration in the fields of accounting and business administration.

ENTRANCE REQUIREMENTS

Good character and an academic background appropriate for the program of studies contemplated are required.

Requirements for admission to the freshman class include:

1. An acceptable certificate of graduation from a U.S. secondary school, showing at least 15 units* which must include four years of English; at least two years of one foreign language; two years of science, preferably with laboratory instruction; two years of social studies, one of which must be American history; and two years of college preparatory mathematics. An applicant whose high school record is deficient in any of these units cannot be admitted until such deficiencies are made up.

* A unit represents a year's study in a secondary school subject, including in the aggregate not less than 120 sixty minute periods, or the equivalent, of prepared classroom work

International students may be considered for admission with an equivalent foreign secondary certificate. A student presenting such a certificate must also show competence in the English language by scoring not less than 550 on the first taking of the TOEFL or 600 on the second taking. International students may be required to enroll in a full-time program in English before beginning studies in a degree program.

2. College Entrance Examination Board scores submitted on the Scholastic Aptitude Test and the English Composition Achievement Test.

Criteria for admission include a strong high school record and a satisfactory performance on the Scholastic Aptitude Test examinations. It is recommended that the examinations be taken in December or January. Scores on tests taken in the junior year may be submitted. Arrangements for tests are the responsibility of the applicant and should be made with the Educational Testing Service, 20 Nassau St., Princeton, N.J. 08540, or 1947 Center St., Berkeley, Calif. 94704, not less than one month before the date of the test. In applying for the test, the applicant should specify that the scores be sent to the Office of Admissions, George Washington University, Washington, D.C. 20052.

The College Entrance Examination Board tests are preferred; however, the American College Testing battery scores will be accepted. The applicant should request that these scores be sent to the Office of Admissions directly from the American College Testing Program, Iowa City, Iowa. It is recommended that the applicant take the tests in October of the senior year.

Admission with Advanced Standing

Requirements for admission of students transferring from other regionally accredited colleges and universities and from other divisions of this University, are as follows:

Ordinarily, students who have accumulated (1) no more than 30 semester hours of transferable relevant academic credit must have a minimum 2.00 cumulative grade index, as well as meeting the freshman requirements; or (2) 31-60 transferable semester hours of relevant academic credit must have a 2.50 cumulative grade index or higher; students with less than 2.50 but not less than 2.00 must meet the freshman requirements; or (3) 61-90 transferable semester hours of relevant academic credit must have a 2.00 or higher cumulative grade index. Advanced standing may be awarded for properly certified courses taken at regionally accredited colleges or universities for which the student received a grade of C or better, and may be applied toward a degree provided they are comparable to the curricular requirements of the degree.

In no case will more than 60 semester hours of advanced standing be granted for course work completed at regionally accredited community or junior colleges. Courses taken at such colleges may be applied toward the Bachelor of Business Administration degree provided they are comparable to BAd 161 or Mgt 148. Other courses (one course per area up to a maximum of three courses), comparable to this School's courses numbered 101-200, taken at an accredited community or junior college where a grade of C or better has been earned may be accepted to waive certain required courses. The waiver of a required course does not entitle the student to any semester hours of credit.

Although a grade of *D* is not acceptable for transfer, the course may be used to satisfy a curricular requirement. Credits earned with a *D* grade may not, however, be counted toward the total number of semester hours required for the degree. Any course completed with a grade of *D* or better may not be repeated for the purpose of earning degree credit.*

The School reserves the right to refuse credit for transfer in whole or in part or to allow credit provisionally.

It is the responsibility of the student to have an official transcript sent directly from each institution formerly attended to the Office of Admissions, George Washington University, Washington, D.C. 20052.

A student wishing to transfer into the School from another division of this University must submit a formal application of transfer to the Office of Admissions.

Courses taken at another division of this University may be applied toward a degree in this School provided they are comparable to the curricular requirements of the degree. A maximum of 90 semester hours of transfer credit may be applied toward a degree program in this School.

In no case will credit for more than 15 semester hours of undergraduate course work taken at this University in nondegree status be allowed toward meeting degree requirements in the School of Government and Business Administration.

Readmission

A student who withdraws, is suspended or is otherwise absent from the University for one semester or more must make formal application for readmission. If readmitted, the student is subject to the rules and regulations in force at the time of return. If the student has attended one or more regionally accredited colleges or universities during absence from the University, complete official transcripts must be sent to the Office of Admissions from each institution attended.

The application fee is waived for a student applying for readmission who was registered as a degree candidate at the time of last registration at the University and who has not since registered at another college or university.

REQUIREMENTS FOR THE DEGREE

Academic Work Load

A full-time student not on probation may not ordinarily take more than 15 semester hours. A student employed more than 24 hours a week, who is not on probation, may not take more than nine semester hours.

A full-time student whose overall quality-point index is 3.50 or higher may take up to 18 semester hours. A student employed more than 24 hours a week, whose index is 3.50 or higher, may take up to 12 semester hours.

A student who accepts employment after registration or at any time during a semester must report immediately to the Dean, so that the program may be adjusted if necessary.

* An exception to this rule is the freshman English composition requirement. Any student earning a grade lower than *C* in English composition at another institution may be required to repeat the course at this University.

Exception to these rules will require the approval of the Dean.

An undergraduate student on probation may take no more than 12 semester hours of course work.

Scholarship Requirements

To graduate, a student must have the following: (1) a general quality-point index of at least 2.00 and (2) a quality-point index in the major of at least 2.00. All courses in the Bachelor of Business Administration degree major or option are to be included in the quality-point index calculation. Elective courses in or out of the School of Government and Business Administration cannot be used as substitutes in the major quality-point index calculation.

DEAN'S HONOR LIST

The names of students who achieve a quality-point index of 3.50 or higher are placed on the Dean's Honor List for that semester. Appearance on the list will be limited to (1) full-time students registered for a minimum of 12 semester hours and (2) part-time students registered for a minimum of 12 semester hours over a period of two consecutive semesters, which may include a summer term.

INCOMPLETE/AUTHORIZED WITHDRAWAL

Conditions under which the grades of *I* (Incomplete) or *W* (Authorized Withdrawal) may be assigned are described on page 45.

The grade of *I* must be removed no later than the last day of the examination period for the fall or spring semester immediately following the semester or summer session in which the grade of *I* is assigned. An "Incomplete" that is not removed within this period is automatically changed to an *F*. In cases of well-documented extenuating circumstances, an instructor and a student may jointly petition the dean, or the appropriate committee, for additional time in which to complete the work of the course. Such petitions should be submitted within the same period. The grade of *I* cannot be removed by reregistering for the course here, or by taking its equivalent elsewhere.

PROBATION

A student whose cumulative quality-point index falls below 2.00 after completing a minimum of 12 semester hours of study will be placed on probation. This probation extends over the period in which the student attempts 12 semester hours of work, which may include remedial studies as prescribed.

SUSPENSION

A student whose quality-point index is 1.50 or below or whose index remains below 2.00 at the end of the probationary period may be suspended. A student suspended for poor scholarship may apply for readmission after

the lapse of either the fall or spring semester. To be considered for readmission, the student must pass prescribed tests and submit evidence to the Committee on Undergraduate Studies of conduct during absence from the University which indicates that the student will profit from readmission. A student readmitted after suspension is on probation and must maintain a current quality-point index of at least 2.50 on each 12 semester hours of work undertaken until the cumulative index is 2.00. In no case will the probationary period after readmission exceed 24 hours of study. A student suspended twice for poor scholarship will not be readmitted.

CREDIT/NO CREDIT OPTION

A junior or senior student who has a cumulative quality-point index of 2.50 or better, may, with the approval of the advisor and the dean, take one course a semester and receive a grade of *CR*, Credit, or *NC*, No Credit, which will be recorded on the student's transcript but will not be reflected in the quality-point index. No student will be allowed to take more than four credit/no credit courses. A student must sign up for such an option at registration. Under no circumstances may a student change from credit/no credit status to graded status, or vice versa, after the end of registration. Courses required in the student's major field may not be taken on the credit/no credit basis. A transfer student may not choose this option until the second semester of enrollment in the University.

Residence

A minimum of 30 semester hours, including at least 12 hours in the major field, must be completed while registered in the School of Government and Business Administration. This requirement applies to students transferring within the University, as well as to students transferring from other institutions. Unless special permission is granted by the dean to pursue work elsewhere, the work of the senior or final year must be completed in the School of Government and Business Administration.

Correspondence and Home-Study Courses

Credit for correspondence or home-study courses is not acceptable and cannot be applied toward a degree in the School of Government and Business Administration.

Earning Credit or Waiving Requirements by Examination

A student may earn credit up to a maximum of 30 semester hours or waive curricular requirements by performing satisfactorily on the following tests:

College-Level Examination Program (CLEP)—See pages 22-23 for general information on the CLEP tests. CLEP tests in Introductory Accounting, Introduction to Business, Commercial Law, and Data Processing are limited to three credits each of advanced standing. CLEP tests in college algebra, trigonometry, and more advanced courses in accounting and business administration are not accepted for advanced standing. Students enrolled

in George Washington University who wish to receive credit for CLEP Subject Examinations must receive prior approval of the department.

Advanced Placement Tests—See page 22.

Achievement Tests—See pages 23-24.

Examinations for Waiving Curriculum Requirements—The School of Government and Business Administration does not administer waiver examinations. However, certain arts and sciences courses may be waived, and in some instances credit may be assigned, by satisfactorily passing a special departmental examination authorized and prescribed by the department or curricular advisor concerned. Requests to take the examination should be made to the curricular advisor and the required fee paid at the Office of the Cashier before the date set for the examination. See page 75 for more information.

CURRICULUM REQUIREMENTS

One hundred and twenty semester hours of course work are required for graduation. To be recommended by the Faculty for graduation, candidates are required to complete, in addition to the appropriate freshman and sophomore work, a minimum of 60 semester hours (second-group course work) in the junior and senior years selected from one of the two major field curricula offered by the School. Courses must be taken in accordance with the academic status of the student (i.e., freshman, sophomore, junior, senior) and with the course prerequisites. The major in accounting or business administration (group option) must be selected at the end of the sophomore year.

Curriculum for the First Two Years in Accounting and Business Administration

FRESHMAN YEAR

		Semester Hours
Mathematics:	Math 31–32 or 51–52*	6
Economics:	Econ 1–2	6
English:	Engl 9 or 10, 11†	6
Science:	BiSc 3–4; Chem 3–4; Geog 51 and 52; Geol 1–2; or Phys 9–10	6
Elective:	Courses other than accounting, business administration or economics‡	6
	Total	30

SOPHOMORE YEAR

Accounting:	Acct 1–2	6
Business Administration:	BAd 51	3

* Math 3, 6, and 9 may not be used for credit towards the B.B.A. degree.

† A [illegible] in English at a [illegible] with a grade of A or B—may substitute for Engl 9 or 10, provided that the student is then ready to go on to Engl 11.

‡ [illegible] may not be taken for credit.)

*Humanities:	Art 31–32 or 71–72; Chin 3–4; Engl 51–52, 71–72, or 191–92; Fren 3–4 or 6, or 51–52; Germ 3–4 or 51–52; Ital 3–4; Mus 3 and 4; Phil 50, 71; Rel 9–10, 21, 22, 23, 50, 60; Slav 3–4, 5–6, or 91–92; Span 3–4 or 6, or 51–52; or SpDr 1 and 11	6
*Social Sciences:	Psyc 1, 8	6
	AmCv 71–72; Anth 1–2; Hist 71–72; PSc 1 and 3 or 2 and 3; or Soc 1 and 2	6
Statistics:	Stat 51	3
	Total	30

Accounting Major†

JUNIOR YEAR

Acct 101:	Cost and Budgetary Control	3
Acct 121:	Intermediate Accounting	3
Acct 161:	Federal Income Taxation	3
Acct 191:	Advanced Accounting	3
BAd 102:	Fundamentals of Management	3
BAd 131:	Business Finance	3
BAd 141:	Basic Marketing Management	3
BAd 161:	Commercial Law	3
Mgt 118:	Introduction to Information Processing	3
Elective:	Selected from courses other than in accounting, business administration or economics	3
	Total	30

SENIOR YEAR

Acct 132:	Accounting Theory	3
Acct 171:	Auditing	3
Acct 181:	Accounting Systems	3
BAd 101:	The Business Environment	3
BAd 181:	Manufacturing Production	3
BAd 198:	Business Policy and Administration	3
Econ 121:	Money and Banking	3
Stat 187:	Theory of Sampling	3
Elective:	Three semester hours selected from courses in accounting,‡ business administration, or economics, and three semester hours selected from courses in other departments	6
	Total	30

ACCOUNTING PRACTICE INTERNSHIP

An internship program, limited to selected senior accounting majors, is available during the semester break of the senior year. To be admitted to this program students must have the approval of the chairman of the Department of Accounting and must have completed at least 15 semester hours of accounting courses, including a course in auditing, by the end of the fall semester of the senior year, and a grade average of 2.9 both in

* Restricted to lower than 100-level courses.
† Requirement: a cumulative grade average of 2.5 or higher at the start of the junior year.
‡ Qualified students accepted in the accounting internship program will elect Acct 199 in place of three semester hours of electives selected from courses in accounting, business administration, or economics.

accounting and overall at the start of the fall semester of the senior year. Students will be paid a salary while conducting audits under senior supervision of participating C.P.A. firms. Other internships with industry and government are available. Students who complete the internship successfully will register for Acct 199 the spring semester of their senior year and will receive three semester hours of credit. For further information consult the chairman of the Department of Accounting.

Business Administration Major

The program in business administration is designed to provide the broad foundation required for eventual leadership in either governmental or business administration. It consists of the 30 semester hours of required courses; 15 hours in one of the following group options; and nine hours of electives, normally advanced courses in liberal arts subjects.

JUNIOR YEAR

		Semester Hours
Acct 193:	Business Budgeting	3
BAd 102:	Fundamentals of Management	3
BAd 105:	Personnel Management	3
BAd 131:	Business Finance	3
BAd 141:	Basic Marketing Management	3
Mgt 118:	Introduction to Information Processing	3
Group Option:	Six semester hours selected from the chosen area of specialization (see below)	6
Elective:	To be selected in consultation with the advisor	6
	Total	30

SENIOR YEAR

BAd 101:	The Business Environment	3
BAd 161:	Commercial Law	3
BAd 181:	Manufacturing Production	3
*BAd 198:	Business Policy and Administration	3
Econ 121:	Money and Banking	3
†Psyc 144:	Personnel and Industrial Psychology or	3
Mgt 107:	Fundamentals of Behavioral Science	
Group Option:	Nine semester hours selected from the chosen area of specialization	9
Elective:	To be selected in consultation with the advisor	3
	Total	30

GROUP OPTIONS

Six areas of specialization are open to business administration majors. The 15 hours taken in each of these options require the approval of the advisor. The group option and the individual courses within the option

*International business majors complete BAd 178, *International Business Policy and Operations* in lieu of BAd 198.

†Marketing option students complete BAd 146, *Consumer Behavior*, in lieu of this requirement.

should be selected *at the beginning of the junior year*. The student should contact the chairman of the Department of Business Administration for assignment of an advisor.

Group I: Economics

The following courses provide the basic academic foundation for such positions as financial economic analyst, industrial economic analyst, and market research analyst in business and government.

BAd 132:	International Business Finance
BAd 133:	Capital Formation
BAd 176:	International Business Theory and Policy
*Econ 101:	Intermediate Microeconomic Theory
*Econ 102:	Intermediate Macroeconomic Theory
Econ 158:	Industrial Organization
Econ 161, 162:	Public Finance I, II
Econ 181–82:	International Economics
Stat 111, 112:	Business and Economic Statistics I, II

Group II: Finance

The following courses provide a basic academic foundation for such financial institution positions as credit analyst, trust analyst, or branch manager; government positions as financial institution examiner or financial analyst, and industry positions as working capital analyst or other staff financial functions.

*Acct 111:	Financial Statement Analysis
Acct 121:	Intermediate Accounting
BAd 113:	Real Estate Investment
BAd 121:	Fundamentals of Insurance and Risk Management
BAd 132:	International Business Finance
BAd 133:	Capital Formation
*BAd 138:	Investment and Portfolio Management
*BAd 139:	Advanced Financial Management
Econ 101:	Intermediate Microeconomic Theory
Econ 123:	Introduction to Econometrics

Group III: Information Processing

The following courses provide the basic academic foundation for positions in information processing in government, business, and industry. They also give the student an understanding of the manager's use of information processing as a vital managerial technique.

*Mgt 119:	Computer Programming for Information Systems
*Mgt 120:	Information Systems Development I
*Mgt 121:	Information Systems Development II
*Mgt 122:	Special Studies in Information Systems

One additional three-credit course, approved by the advisor, is required.

Group IV: International Business

The following courses provide the basic academic foundation for positions in international business, both in private industry and in government. Students in this option who have received credit for two years of a modern foreign lan-

* Required for this group option.

grade or the equivalent, are required to take only 12 semester hours from the following courses.

*BAd 132:	International Business Finance
BAd 143:	Marketing Research
*BAd 144:	International Marketing Management
BAd 147:	Advertising
BAd 171:	Principles of Transportation
*BAd 175:	Introduction to International Business
BAd 176:	International Business Theory and Policy
Econ 182:	International Economics
HKLS 104:	Introduction to Travel and Tourism

Group V: Marketing

The following courses provide the academic and applied foundation for careers in marketing and distribution. The marketing process involves analysis, planning and control efforts in moving goods and services from producers to the ultimate consumers. Marketing activities are also important in the operations of public, non-profit and professional institutions. The courses listed provide the basic academic foundation for positions such as marketing manager, sales manager, advertising director, advertising account executive, sales promotion manager, merchandising manager, brand manager, product development specialist, market research director, and consumer affairs specialist.

*BAd 143:	Marketing Research
BAd 144:	International Marketing Management
BAd 145:	Sales Management
BAd 147:	Advertising
BAd 148:	Seminar: Retailing Management
BAd 171:	Transportation and Logistics Management
BAd 175:	Introduction to International Business
Jour 145:	Principles and Problems of Public Relations
Stat 105:	Statistics in the Behavioral Sciences
Mgt 119:	Computer Programming for Information Systems

Group VI: Personnel Management

The listed courses provide the basic academic foundation for such positions as personnel manager, employee relations manager, and employment manager in business and government service.

*BAd 106:	Leadership in Personnel Management
*BAd 107:	Collective Bargaining
Jour 145:	Principles and Problems of Public Relations
Psyc 129:	Theories of Personality
Psyc 131:	Psychological Tests
SpDr 121:	Group Discussion and Conference Leadership

THE MASTER'S DEGREES

Master of Accounting—The degree of Master of Accounting is designed to provide the specialized study necessary in the preparation for a career in accounting with particular concern for professional certification. See pages 195-96 for course requirements and degree prerequisites.

Master of Business Administration—The degree of Master of Business Administration is this School's principal professional degree in business. It

* Required for this group option

is designed to develop the analytical ability and perspective which will contribute to success as a responsible executive. Because of the increasingly close relationship between government and business, the programs for this degree also provide an excellent background for many government careers.

Master of Public Administration—The degree of Master of Public Administration is primarily for those already in public service careers—federal, state, local, intergovernmental, or international—and for those seeking management careers in government. The program provides students with an appreciation of the special requirements of public service, while at the same time helping them to improve their own analytical and decisional capabilities. The degree is interdepartmental in nature, but the major emphasis is in the Department of Public Administration.

Master of Arts in Health Care Administration—This professional degree is designed to prepare students with interdisciplinary training for professional practice in administration and planning roles in public and private health organizations. Study may be made of various aspects of administration of short-term hospitals, long-term health facilities (such as extended-care institutions, nursing homes, mental hospitals, facilities for the aged), group practice clinics, health information systems, and health planning agencies.

Master of Urban and Regional Planning—This professional planning degree is designed as preparation for careers on the municipal, county, state, and national levels in both public service and private consulting practice. The program of study is planned to provide a broad education, to develop competence in planning theory and methodology, and to emphasize the analytical ability and creativity necessary for solving urban and regional problems.

ENTRANCE REQUIREMENTS

To be considered for admission applicants must present the following minimum credentials: a bachelor's degree from a regionally accredited college or university, including at least 90 semester hours of academic work with an overall quality-point index of 2.50 (on a 4.00 scale) and a score of at least the 50th percentile on the applicable admission test.

Applicants whose undergraduate quality-point index is less than 2.50 or whose admission test score ranks beneath the 50th percentile may be considered if (1) the quality-point index multiplied by 200 and added to the admission test score equals 950 points, or (2) the upper division undergraduate (last two years of undergraduate work) quality-point index multiplied by 200 and added to the admissions test score equals 1,000 points.

Applicants for admission to programs leading to the degree of Master of Business Administration must submit acceptable scores on the Graduate Management Admission Test; applicants for admission to programs leading to the degrees of Master of Arts in Health Care Administration*, Master

* Scores on the Miller Analogies Test are also accepted in place of the Graduate Management Admission Test or the Graduate Record Examinations for admission to the program of study leading to the degrees of Master of Arts in Health Care Administration, Master of Public Administration, and certain concentrations in the degree of Master of Science in Administration.

of Public Administration, and Master of Urban and Regional Planning must submit scores on the Graduate Management Admission Test or the Graduate Record Examination. It is the responsibility of the applicant to make arrangements for the required test with the Educational Testing Service, Princeton, N.J. 08540. Correspondence concerning the Graduate Management Admission Test should be addressed to Box 966; concerning the Graduate Record Examination, to Box 955.

Waiver of the admission test may be requested, by letter, by applicants who meet the following criteria: (1) the undergraduate quality-point index exceeds 3.00, (2) the undergraduate degree was conferred no more than five years previously, and (3) the undergraduate major was a discipline which supports the graduate program for which the application is made. The Admissions Office will let the applicant know whether or not the waiver will be granted.

GENERAL REQUIREMENTS

All students must complete the prescribed minimum number of semester hours of graduate course work. A maximum of one-quarter of the semester hours of graduate course work required for a degree may be approved for transfer to the School of Government and Business Administration from the Division of University Students, another degree-granting division of this University, or another accredited college or university under the following conditions: the course work must be approved as part of the student's program of studies, it must not have been applied to the completion of requirements for another degree, it must be at the graduate level, it must have been taken within the past two years, and the student must have received a grade of *B* or better. This action must be approved by a petition to the advisor and the dean. A transcript of the course work must be on file before the petition can be considered.

Extended programs, including undergraduate background courses, may be assigned for an applicant whose undergraduate degree was in a field other than the graduate program the student wishes to follow, or whose undergraduate record indicates a weakness in required background courses.

Master's degrees are awarded by vote of the Faculty on completion of the required course work, an acceptable thesis (if one is elected or required) or the equivalent work, and the passing of the Master's Comprehensive Examination if required in the chosen degree or concentration.

Second-group courses (numbered 101-200) may be counted toward the master's degree only when registration for graduate credit has been approved at the time of registration by the dean and the curriculum advisor. No work counted toward a bachelor's degree may be counted toward a master's degree.

Full-time students are normally expected to register for nine to 12 semester hours each semester. A graduate student who is employed more than 20 hours a week may not take more than six semester hours. All work for a master's degree *must be completed in five years, unless* an extension of time is granted by the dean.

Students who expect to continue studies for the degree of Doctor of Business Administration or Doctor of Public Administration after receiving the master's degree should ask for assistance in planning programs so that they may qualify for admission to candidacy for the doctorate.

No credit is granted for work done *in absentia* or without formal instruction, except for hospital residency, supervised field experience and the thesis, which may be completed *in absentia* with the permission of the department, curriculum advisor or committee concerned.

MASTER'S COMPREHENSIVE EXAMINATION

Written Master's Comprehensive Examinations are required only in certain degrees and fields of concentration. Degree candidates should consult faculty advisors about examinations required and material to be covered. In writing the examinations students are expected to correlate what has been learned in course work and from the literature of the field. The examinations normally require four to eight hours. Sections broadly cover the various fields which the candidate has selected for specialization.

Examinations are generally scheduled three times a year, in late November or early December, April, and August, and should be taken during the last semester of course registration or shortly after completion of prescribed course work. [In the Department of Urban and Regional Planning examinations are scheduled in January and May.]

A written application is filed with the department supervising the student's field of study at the time of registration for the semester in which the examination is to be taken. Before applying, the student must have completed all courses in the program or be enrolled in the last semester and must have achieved a 3.00 [*B*] average. After applying for the examination, a candidate may withdraw only by written notice to the department chairman.

A candidate who fails the examination should consult with the faculty advisor as to a subsequent course of action.

SCHOLARSHIP REQUIREMENTS

Grades for graduate work are *A*, Excellent; *B*, Good; *C*, Minimum Pass; *F*, Fail; *I*, Incomplete; *W*, Authorized Withdrawal; and *CR*, Credit.

An average of *B* or better is required for the master's degree. The grade of *C* is not considered as failing but must be balanced by a grade of *A* in a graduate course of equal status.

A student whose quality-point index falls below 3.00 after completing a minimum of 12 semester hours of study will be placed on probation. This probation extends through the period in which the student next attempts 12 semester hours of work, including prescribed courses. During this period the student's performance will be monitored to determine suitability for continued study. A student who is subject to probation for a second time is automatically suspended.

A master's degree candidate who receives a grade of *F* is required to present cause, for consideration by the dean, as to why continued study should be permitted.

A master's degree candidate given the grade of *F* in a required course must repeat the course and achieve at least the grade of *B*. [Such a retake does not expunge the grade of *F* and it remains part of the student's record.] Should this level of performance not be obtained, the student will be denied further registration as a degree candidate.

SUSPENSION

A graduate student who does not meet the conditions of probation (see above) will be suspended or asked to withdraw. A student who is suspended or withdraws under these conditions may apply for readmission after the lapse of one semester. To be readmitted the student must submit evidence which indicates academic success if readmitted. A student so readmitted will continue on academic probation and must achieve a minimum quality-point index of 3.50 in the next 12 semester hours of graduate study. Should the student fail to achieve this minimum quality-point index a second suspension will result and subsequent readmission will be denied.

INCOMPLETE/AUTHORIZED WITHDRAWAL

Conditions under which the grades of *I* (Incomplete) or W (Authorized Withdrawal) may be assigned are described on page 45.

The grade of *I* must be removed no later than the last day of the examination period for the fall or spring semester immediately following the semester or summer session in which the grade of *I* is assigned. An "Incomplete" that is not removed within this period is automatically changed to an *F*. In cases of well-documented extenuating circumstances, an instructor and a student may jointly petition the Dean, or the appropriate committee, for additional time in which to complete the work of the course. Such petitions should be submitted within the same period. The grade of *I* cannot be removed by reregistering for the course here, or by taking its equivalent elsewhere.

The Thesis

Students contemplating doctoral study are strongly urged to include the thesis as an elective in their master's program. The thesis subject should be selected as early as possible so as to permit effective integration with the course work.

The subject must be approved by the professor in charge of the student's field. The thesis in its final form must have the approval of the professor in charge and must be presented to the Dean by the student no later than the date announced in the calendar. Printed copies of detailed regulations regarding the form and reproduction of the thesis are available in the Office of the Dean.

Payment of tuition for the thesis entitles the candidate, during the two semesters in which registered for thesis (299–300), to the advice and direction of the member of the Faculty under whom the thesis is to be written. In case a thesis is unfinished additional time is granted. The student must, however, be enrolled continuously in the program. If the preparation of the thesis extends more than three semesters beyond the date registered for thesis 300, the student must register for the entire six hours of thesis again and pay tuition as for a repeated course.

MASTER OF BUSINESS ADMINISTRATION

The program of study leading to the professional degree of Master of Business Administration includes the following requirements:

1. *The recognized Common Body of Knowledge in business administration*

This may be fulfilled by waiver for prior work completed or by completing the courses listed below with a QPI of 3.00 or higher except that BAd 297 may not be waived. A student with an undergraduate degree in business administration from an institution accredited by the American Assembly of Collegiate Schools of Business is considered as having completed the Common Body of Knowledge, except for BAd 297. These courses are designated as parts of the Common Body of Knowledge and may not be applied to fulfillment of other requirements for the degree.

The Common Body of Knowledge Courses	Semester Hours
Acct 201; BAd 201, 250, 270, and 297; Econ 217 and 218; Mgt 200, 202, 218	30

2. *General instruction in administration*

This is fulfilled by completion of at least fifteen semester hours of course work beyond that in the Common Body of Knowledge and outside of the field of concentration, planned and scheduled with the student's academic advisor. The courses are selected to increase the student's general competence for overall management 15–18

3. *Field of concentration*

This is fulfilled by completion of at least twelve semester hours of course work in a single concentration, planned and scheduled with the student's academic advisor 15–12

Total 60

Fields of Concentration

Students select a minimum of 12 semester hours from one of the following fields of concentration.

ACCOUNTING

This field provides a contemporary, broadly based academic preparation for the field of general administration in which the manager employs accounting as an effective means of understanding the organization. (See pages 195-96 for programs of study in accounting.)

ADMINISTRATION OF SCIENCE AND TECHNOLOGY

This field explores the many aspects of technology relating to and influencing research and development management, business, and public policy. The employment of "state-of-the-art" technology and the creation of new technology through research and development are important processes in the achievement of the objectives of both private firms and governments.

The research and development environment has many unique operational characteristics. The concentration has been designed to identify and study

the problems associated with managing creative professional people in a dynamic technology. As a contextual area, the program stresses the need for students to undertake original and meaningful research involving political, economic, sociological, and operational problems encountered by management in industrial, governmental, and military research and development organizations.

HUMAN SYSTEMS

This field of study reflects the assumption that the effective utilization of the behavioral sciences is concerned with both means and ends; that the specialist in behavioral science not only is skilled in theory and research but also applies technical and specialized knowledge as a conscious force in effective organizational growth and improvement. Thus, courses are designed to equip the student with organizational concepts and behavioral skills appropriate to optimizing the utilization of a human system's total resources.

This program helps to meet the need for professionals capable of designing, creating, and developing the necessary behavioral and organizational systems appropriate to rapidly changing societies. Emphasis is on the interrelationships of such dimensions as motivation, leadership, problem-solving, organizational growth, and increased complexity of modern organizations and their effect upon the functions of organizational development.

BUSINESS, ECONOMICS, AND PUBLIC POLICY

This field is directed toward understanding, analyzing, and coping with the principal forces shaping the total business environment. Special attention is paid to the policies and programs of governments, social and cultural change, and the structure, evolution, and fluctuations of the economy. Students concentrating in this area can select courses that form a basis for expertise in those aspects of business policy and planning that deal with the external environment of the firm. Areas covered are government-business liaison functions on a domestic or multinational basis, business representation in public decision-making, and public-policy responses to business. Students will be instructed in analytical skills chosen electively from economics or policy analysis and in subject areas chosen electively from such topics as are described above.

FINANCE AND INVESTMENTS

This field prepares students for careers in finance and investments, providing a background in business budgeting, controllership, treasury, long-range planning, reporting and financial management processes. Courses are designed to emphasize the planning, analysis, implementation, and controls necessary for making effective financial decisions. Instruction not only applies to manufacturing and trading enterprise but, in addition, includes railroad and public utility financing. Each, however, has distinctive operating features. Most financial dogmas have a universality that cuts across business lines, and variations are more a matter of degree than a form of substantive difference.

GENERAL MANAGEMENT SYSTEMS AND ORGANIZATIONAL CYBERNETICS

This field addresses the critical need for management to deal effectively with the fact that human institutions of all kinds tend to become larger and more complex as changes accelerate both socially and technologically. In many traditional academic fields general systems and cybernetic concepts have evolved as the interdisciplinary mode for understanding increasingly complex systems. This has profound relevance for the contemporary operating manager and policy-maker.

Because this program is essentially interdisciplinary and transcontextual in nature, the student is afforded an unusually broad range of opportunities to apply educational experience to managerial, organizational and societal problems. Professional and academic career potentials are available in the following fields: (1) research and teaching in the growing number of systems and cybernetics oriented programs now emerging in colleges and universities in the United States and elsewhere in the world; (2) institutional/environmental interface management or consulting; (3) system-focused organization development consulting or staff work; (4) corporate and government agency long-range (strategic) planning and control activities; and (5) advisory and staff positions and program directors in global agencies such as operating components of the United Nations, multinational corporations and foundations, and multi-governmental agencies such as OECD, as well as in the agencies and departments of national governments.

INFORMATION SYSTEMS TECHNOLOGY

This field is designed to provide a managerial understanding of the principles of manual, mechanical, and electronic information processing, including computer programming concepts, methods, and languages; an appreciation of the capabilities, limitations, and selection procedure of information processing equipment; a knowledge of all phases of management information systems development, implementation, and evaluation; and an understanding of the roles of both management and systems personnel in information technology. It also provides an appreciation of the role of information systems technology as a tool of management.

Students participate in the development of management information systems; in the selection of computer equipment; and in the installation, management, and evaluation of management information systems—during class sessions.

INTERNATIONAL BUSINESS

This field is designed to prepare students for careers in firms operating on a multinational basis or about to enter the international field; for careers in the federal government and in international agencies concerned with business, industry and finance abroad; and for the commerce option of the Foreign Service Officer Examination.

This program is also designed to provide foreign students with the background and skills necessary to promote international business, and to prepare them for careers in foreign and domestic firms within their own countries and for commercial officer positions within their governments.

Each student's program is individually developed by the student's advisor according to the student's background and interests.

MARKETING

This field is devoted to the development of professional marketing managers whose responsibilities may include planning and developing new products, services, and ideas; advertising, selling, and merchandising; and arranging distribution channel systems. Courses cover all aspects of the marketing management function. Foundation courses are *Marketing Management*, *Buyer Behavior*, and *Marketing Research*. Functional courses are *Promotion Management*, *Marketing Channels*, and *Marketing Strategy*. Specialized elective courses, *International Marketing*, *Marketing to the Government*, and *Marketing and Public Policy*, utilize the resources of the Washington metropolitan area.

PERSONNEL MANAGEMENT

This field is concerned with all aspects of the employment of human resources in business organizations. Career opportunities are open in domestic and international business organizations, hospitals, trade associations, research and educational institutions and local, state and federal government agencies. Courses encompass all phases of the recruitment, selection, employment, and development of people, industrial relations, unionism, collective bargaining, labor relations and manpower utilization.

PROCUREMENT AND CONTRACTING

This field responds to the recognized need for greater professionalism and sophistication among those engaged in procurement activities of the federal government and in contracting activities of vendors to the federal government.

The sustained increase in federal purchasing—in volume, variety, and complexity—places ever greater demands upon the skill and resourcefulness of procurement and contracting personnel. The field has therefore been designed with the following objectives: (1) to provide a broad professional education in the knowledge and skills necessary for success in this field; (2) to develop in the student increased ability in analysis, decision-making, and communications; (3) to increase the student's appreciation of the economic, social, legal and technological considerations present in procurement and contracting activity.

QUANTITATIVE ANALYSIS FOR DECISION-MAKING

This field develops a thorough understanding of quantitative or mathematical approaches to problems of managerial control and decision-making. While the program will develop a competent background in basic mathematical theory associated with the various techniques, it is oriented

toward applications of the techniques rather than their theoretical mathematical content.

MASTER OF PUBLIC ADMINISTRATION

The Master of Public Administration (MPA) degree program prepares the student for a professional career in public service. The 42 hour program outlined below is intended to provide both a generic core for all students and specialized elective tracks tailored to the interests and career objectives of each individual student. The curriculum provides appropriate instruction in all areas recommended by the Guidelines and Standards for Professional Master's Degree Programs issued by the National Association of Schools of Public Affairs and Administration.

All students are required to complete an eight course (24 semester hour) core, which includes courses in public administration and management, public expenditure analysis, public policy, organization theory, human behavior in organizations, and research methods; at the end of the program, students are required to take PAd 289 which serves to integrate the diverse perspectives in public administration.

Each student selects, in addition, an elective field designed to provide him or her with deeper and broader knowledge in a field of particular interest. The elective fields generally require a four course sequence. The program is sufficiently flexible that, with the approval of a faculty advisor, the student may design a special field which meets his or her individual learning and career objectives.

Students who lack substantial knowledge of the structure and functioning of government are strongly encouraged to take one of two courses in American administrative institutions: PAd 241 *Administration in the Federal Government* or PAd 242 *Administration of State and Local Governments*. The remainder of the program consists of one to three elective courses chosen by the student with the advisor's approval. The electives may be taken in any related program or discipline.

Because the public service requires a wide variety of expertise, students with all undergraduate degree backgrounds are considered for admission. There are no specific course prerequisites.

Required Courses

PUBLIC ADMINISTRATION REQUIRED CORE (24 hours)

1. PAd 205 Introduction to Public Administration and Management
2. PAd 295 Research Methods
3. PAd 296 Statistical Applications in Public Administration
4. PAd 261 Policy Analysis in Public Administration *or*
   PAd 260 Policy Formulation and Administration
5. Mgt 207 Human Behavior in Organizations
6. PAd 221 Organization Theory and the Public Sector *or*
   PAd 223 Behavioral Factors in Large and Complex Organizations
7. PAd 252 Public Expenditure Analysis and Planning
8. PAd 289 Public Program Management and Policy Implementation

ELECTIVE FIELDS (12 hours)*

Budget and Public Finance
Governmental Administration
Organization and Management
Policy Analysis and Evaluation
Public Personnel Administration and Manpower
Urban Administration

AMERICAN ADMINISTRATIVE INSTITUTIONS (3 hours)
One of the following is recommended as an introductory course:

PAd 213 Administration in the Federal Government
PAd 242 Administration of State and Local Governments

ELECTIVE COURSES One to three courses (3 to 9 hours)

Elective Fields

The six elective fields offered within the Department of Public Administration are described below. Other SGBA fields are described elsewhere. Twelve hours are required for each field.

BUDGET AND PUBLIC FINANCE

This field covers the processes and institutions involved in budgeting, including the practical requirements of financial management; addresses issues of intergovernmental finance in a Federal system; and imparts knowledge of alternative methods for allocating scarce public resources. The field is most directly suited to those who are or envision becoming budget analysts or financial management officers in public agencies.

GOVERNMENTAL ADMINISTRATION

This field offers the student a broad understanding of some of the major functions critical to effective public management, including personnel, budgeting, and the law. For those entering the MPA program directly from an undergraduate program, this field provides insight into several potential areas for future specialization, employment, or research. For mid-career public officials, this field provides the opportunity to explore more systematically and analytically the governmental functions they have observed in practice.

---

* Students may also elect such other standard four-course SGBA fields as: Business, Economic, and Public Policy; Human Systems; Information Systems Technology; International Business; and Quantitative Analysis for Decision-making. Students may also take an approved four-course sequence in the Department of Health Care Administration or the Department of Urban and Regional Planning. Moreover, a special field may be constructed, tailored to the student's academic interests and career objectives. To take a special field, the student writes a brief justification specifying the courses to be taken, and submits it by petition through the faculty advisor.

ORGANIZATION AND MANAGEMENT

This field gives primary attention to the processes by which organizations are structured and their work undertaken. It includes courses in organizational theory, but is also concerned with the management of governmental programs. It is for students who envision careers in administering public sector programs.

POLICY ANALYSIS AND EVALUATION

The policy field is designed for those who wish to focus on the processes of public decision-making, and to develop abilities to analyze and evaluate those processes. This field is most directly appropriate for those who now hold or anticipate taking staff analyst positions in government agencies, or similar positions in research or consulting firms.

PUBLIC PERSONNEL ADMINISTRATION AND MANPOWER

This field addresses the traditional concerns in public administration with personnel, the staffing function of public organizations, and labor relations in the public sector. Courses are also offered in manpower development and the use of human resources. Graduates concentrating in this field typically work in personnel administration at some level of government.

URBAN ADMINISTRATION

This field is designed for students interested in pursuing careers in state and local government administration. Students learn to deal with a range of Federal, state, and local problems and issues, including alternative governmental structures and assignments of functions, sources of revenues and expenditure patterns, intergovernmental relations and management concerns, local government financing, and the formulation and analysis of urban policies.

Internships

Students with little or no professional experience are strongly encouraged to take an internship during the MPA program. There are many opportunities in the Washington area for intern experiences in Federal agencies, in county and city government agencies, and in the quasi-public sector. The Department assists students in securing appropriate internships; students are also encouraged to find internships on their own initiative. A substantial effort is made to relate the intern experience to the student's academic program. Internships may be paid or unpaid, and taken for credit or not for credit. To receive academic credit, students must have completed nine credit hours in the degree program. In general, internships for credit involve 15-20 hours of work per week for 14 weeks.

MASTER OF URBAN AND REGIONAL PLANNING

The program of graduate study in Urban and Regional Planning leads to the professional planning degree of Master of Urban and Regional Planning. It is designed as preparation for careers on the municipal, county, state, and national levels, and for private practice. The course of study is designed to provide a broad education, to develop competence in planning theory and methodology, and to emphasize the analytical ability and creativity necessary for solving urban and regional problems. Each student's program is designed in consultation with an assigned faculty advisor in accordance with individual career plans.

The degree is awarded by vote of the faculty after satisfactory completion of (1) from 45 to 50 semester hours of course work, depending upon the background and experience of each individual student, including a thesis equivalent to six semester hours (most students will ordinarily be required to take 50 semester hours); (2) a minimum of three months' full-time professional training in a planning agency under qualified supervision, with an acceptable written report to be submitted after completion of the training period; (3) a written Master's Comprehensive Examination; and (4) a thesis based on the candidate's research in the field of urban and regional planning.

MASTER OF ARTS IN HEALTH CARE ADMINISTRATION

The program of study leading to the degree of Master of Arts in Health Care Administration consists of a basic minimum two-year period of graduate study, normally including both on-campus academic studies and off-campus field practice assignments. The length of each period is dependent upon the study emphasis concentration which the student elects. The majority of students begin their studies in the fall semester of each year. However, a limited number of qualified students may be admitted to begin their course work in the spring semester and summer sessions. The basic curriculum is developed in keeping with the background and professional needs of each student and ordinarily consists of a minimum of 45 semester hours. Undergraduate courses in accounting, economics and statistics (three semester hours each) are required as a prerequisite for all of the concentrations in this program.

Ordinarily full-time students can expect to complete the on-campus phase of the degree program in two to three semesters, and the administrative residency or field practice in one to two calendar years. The total time depends on past academic course work and experience in the health care field.

Fields of Concentration

Students will select one of the following concentrations: administration of long-term care facilities, health planning, health information systems or hospital administration.

ADMINISTRATION OF LONG-TERM CARE FACILITIES

This concentration is designed to prepare students for administration in

such areas as nursing homes, facilities for the aged, mental hospitals and community health clinics.

During the first phase the student must complete a satisfactory academic program of course work, selected in accordance with the student's background and needs. These courses cover the general technical background of health care administration, general administrative theory and practice, and problem-solving in the management of extended care and long-term care patients.

The second phase is a period of field experience as an administrative resident under a qualified preceptor. A written major report or selected field project reports are required.

HEALTH POLICY AND PLANNING

This concentration is designed to prepare students to plan for and coordinate all aspects of private and public health care systems in accordance with sound management principles. It is an interdisciplinary program which includes courses from (1) health care administration; (2) health care planning; (3) supporting disciplines such as sociology, urban and regional planning, quantitative methods, and public administration; and (4) a particular area of concentration selected by the student to gain a specific skill.

In addition to the course work there are periods of supervised field experience. Written reports are required.

HEALTH INFORMATION SYSTEMS

This concentration recognizes the rapidly growing demand for individuals who can develop and implement the use of computer-based information systems in decision-making approaches. It is designed to prepare those who wish to supervise and coordinate data collection, processing and retrieval activities for health care complexes.

During the first phase the student must complete a satisfactory academic program of course work, selected in accordance with the student's background and needs. These courses cover the general and technical background of health care administration and general administrative theory and practice. In addition, students must complete required courses in computer services and information handling.

The second phase consists of supervised field experience, which includes written reports.

HOSPITAL ADMINISTRATION

This concentration is divided into two phases. During the first phase the student must complete a satisfactory academic program of course work, selected in accordance with the student's background and needs. These courses cover the general and technical background of health care administration, general administrative theory and practice, and problem-solving in management as it relates to short-term care hospitals.

The second phase is a period of field experience as an administrative resident under a qualified preceptor. A written major report or selected field project reports are required.

POST-MASTER'S GRADUATE CERTIFICATE IN HEALTH CARE ADMINISTRATION

Students with approved master's degrees from accredited institutions may take a special post-master's program leading to a Post-master's Graduate Certificate in Health Care Administration. Each program will be planned to meet the professional needs of the individual student, whether the student wishes to undertake a new field of study or to amplify knowledge of work done at the master's level.

DOCTORAL PROGRAMS

Study for the degree of Doctor of Business Administration (DBA) and Doctor of Public Administration (DPA) is supervised by the Committee on Doctoral Studies.

Admission

The minimum admission requirement is a bachelor's degree, preferably with a major appropriate to the proposed field of study. Applicants whose degrees are in fields other than business or public administration are expected to obtain the necessary background either before or soon after admission to the program. Scores on the Graduate Record Examination or the Graduate Management Admission Test are required. However, applicants who have taken the Law School Admission Test or the Medical College Admission Test may submit these test scores for consideration. Under special circumstances, scores on the Miller Analogies Test may also be submitted. Applicants whose test scores are more than 10 years old are encouraged, but not required, to take or retake the Graduate Record Examination or the Graduate Management Admission Test. Arrangements to take these tests must be made with the Educational Testing Service. Students whose native tongue is not English must also submit the Test of English as a Foreign Language (TOEFL) scores (see pages 25-26)

The Doctoral Committee does not use specific cutoff points for grade averages and test scores. It carefully reviews each applicant's entire record and makes its selection on a competitive basis in keeping with enrollment limitations.

This evaluation takes three to four weeks, after which the Admissions Office notifies each applicant, through the mail, of the Committee's decision. Completed applications must be sent to the Office of the Admissions Officer, School of Government and Business Administration, George Washington University, Washington, D.C. 20052, by March 1 for the fall semester and summer sessions, and by October 1 for the spring semester. Graduates of non-U.S. universities must apply by February 1 for the fall semester and summer sessions, and by September 1 for the spring semester.

Plan of Study

The doctoral programs in both Business Administration and Public Administration consist of two major parts: the pre-dissertation stage and the

dissertation stage. The objective of the pre-dissertation stage is to provide the student with the theoretical foundations and practices of the major and supporting fields of study and with a command of the relevant qualitative or quantitative analytical methods. The objective of the dissertation stage is to have the student apply the obtained theoretical and practical knowledge and analytical methods to the resolution of a research problem. The research should be original and is expected to result in a contribution to the existing body of knowledge on business administration or public administration. Such a contribution can be either applied or theoretical. The total program must be finished in seven years; extensions beyond this time limit can be given by the Committee on Doctoral Studies only under very special circumstances.

The pre-dissertation stage is based on an individual study plan developed by the student under the guidance of a major and supporting field advisor during the first academic year. In the study plan the student must state long-range professional objectives, all proposed academic activities, methods of evaluation, and a semester-by-semester schedule.

All students, regardless of the degree they seek and of the major field of study, must include in their Study Plan Met 390, *Philosophical Foundations of Administrative Research*, and the multidepartmental course, 311-312, *Seminar: Public-Private Sector Institutions and Relationships*. These courses should be taken during the first academic year after admission.

In addition to the evaluation methods proposed in the study plan the major and supporting field advisors are expected to evaluate the student's progress at the end of the first and second semesters after admission, and thereafter before the end of the spring semester of each academic year.

Major and supporting fields of study include:

Accounting
Applied Economics
Finance and Investment
General Management Systems and Organizational Cybernetics
Government and Business Relations
Health Care Administration
Human Systems
Information Systems Technology
International Business
Management of Science and Technology
Marketing
Materials and Operations Management
Personnel Management
Public Administration
Quantitative Analysis for Decision-Making
Urban and Regional Planning*

A student seeking a DPA degree is required to take public administration at least as a supporting field, to include in the study plan three doctoral-level courses in public administration, and to engage in activities as specified by the field advisor.

While the major field of study must be selected from the above list, supporting fields can be chosen from other departments of the University. A student selecting a field outside of the School, however, must meet the academic and administrative requirements of the department involved.

For more detailed information on the program and its administration, see the *Handbook of the Doctoral Programs in Business Administration and Public Administration*, available in the Doctoral Programs Office.

* Can be selected only as a supporting field.

SPECIAL PROGRAMS

Government Intern Scholarship Program

The Government Intern Scholarship Program offers annually 50 scholarships to assist government agencies in training carefully selected young men and women for administrative leadership in government career service. Each scholarship provides full tuition for two three-hour courses in one semester, and interns who maintain satisfactory standing in both their academic program and their government training program may qualify for a second scholarship for an additional semester.

Continuing Education in Health Care Administration

A nondegree program is conducted, both on campus and off campus, in the various areas of health care administration whenever a sufficiently large class is organized. Institutes, workshops and lecture series are conducted under the auspices of program faculty and selected leaders from local, state, and national areas on topics of current interest to the requesting organization. There is no specific prerequisite. Fees are to be announced.

International Institute for Health Care Administration

In recognition of special educational needs of students from other countries, the International Institute for Health Care Administration offers programs of instruction designed to meet these needs at either the degree or certificate level.

It is also equipped to enter into arrangements with principals of hospital systems in world wide areas to assist in the preparation of teaching programs or the actual instruction of administrative personnel either abroad or at the University.

Combined Master's and Juris Doctor Degree Program

In certain instances arrangements may be made for students to work concurrently toward both the Juris Doctor degree in the National Law Center and a master's degree in some fields in the School of Government and Business Administration. Students must be admitted both to the National Law Center and, separately, to the School of Government and Business Administration and must meet all requirements in each degree program. It is possible for a student to complete work for both degree programs within four years.

Certification of Purchasing Managers

The School of Government and Business Administration participates in the three nationally recognized certification programs.

Certified Public Purchasing Officer (CPPO)
Administered by:
National Institute of Governmental Purchasing
1001 Connecticut Avenue, N.W.
Washington, D.C. 20036

Certified Professional Contracts Manager (CPCM)
Administered by:
National Contract Management Association
Crystal Plaza #1, Suite 808
2001 Jefferson Davis Highway
Arlington, Virginia 22202

Certified Purchasing Manager (CPM)
Administered by:
National Association of Purchasing Management
11 Park Place
New York, New York 10007

Bachelor of Science in Health Care Administration

A program of study leading to the degree of Bachelor of Science in Health Care Administration develops persons for beginning administrative and planning level positions in hospitals and related health organizations. At this time the degree program is limited to students in the Naval School of Hospital Administration in Bethesda, Md.

SCHOOL OF PUBLIC AND INTERNATIONAL AFFAIRS

Dean B.M. Sapin

FACULTY*

Professors J. Aschheim, R.H. Davison, R.M. Dunn, Jr., M. Gordon, A. Gyorgy, P.P. Hill, H.C. Hinton, M.A. Holman, C. Hoshiko, J.W. Kendrick, Y. Kim, H.L. LeBlanc, R.K. Lewis, J.C. Lowe, J.A. Morgan, Jr., J.N. Mosel, C.A. Moser, B. Nimer, V. Petrov, H. Pollack *(Research)*, B. Reich, J.W. Robb, H.M. Sachar, B.M. Sapin, R.P. Sharkey, C.W. Shih, G. Sgan, H. Solomon, G. Stambuk, C.T. Stewart, Jr., R.B. Thompson, R. Thornton, H.B. Yakobson
Adjunct Professors T.F. Carroll, W.H. Lewis
Associate Professors R.L. Cole, C.F. Elliott, R.S. Goldfarb, W.R. Johnson, P.F. Klarén, C.A. Linden, J.M. Logsdon, J.K. McDonald, H.R. Nau, G.A. Olkhovsky, E.O. Pederson, A.H. Teich, S.J. Wayne, A.M. Yezer, R.Y. Yin
Adjunct Associate Professor V.T. Coates
Assistant Professors C.M. Aho, J.L. Casler, D. Fischer, A.K. Fitzsimmons, D.L. Lee, S.D. Lund *(Visiting)*, C. McClintock, L.P. Rihuffo, S. Shaffer, R. Sloss, M. Sodaro *(Visiting)*, G.C.Y. Wang, S. Wolchik *(Visiting)*

* The President of the University, the Vice President for Academic Affairs, the Registrar of the University, the Director of Admissions of the University, and the University Librarian are *ex officio* members of the Faculty of the School of Public and International Affairs.

Committees*

DEAN'S COUNCIL

R.L. Cole, C.F. Elliott, M. Gordon, P.P. Hill, H.C. Hinton, W.R. Johnson, C.A. Linden, J.M. Logsdon, J.K. McDonald, H.R. Nau. V. Petrov, S. Shaffer, C.W. Shih, G. Stambuk, A.H. Teich, R. Thornton

COMMITTEE ON PROGRAMS AND CURRICULUM

R.H. Davison, R.M. Dunn, Jr., A. Gyorgy, H.C. Hinton, Y. Kim, J.M. Logsdon, J.C. Lowe, B. Nimer, C.W. Shih

COMMITTEE ON ADMISSION AND ADVANCED STANDING

M. Gordon, W.R. Johnson, C.A. Linden, A.H. Teich, A.M. Yezer

COMMITTEE ON EAST ASIAN STUDIES

W.R. Johnson *(Chairman)*, H.C. Hinton, Y.C. Kim, C. Shih, G. Sigur, R. Thornton, R.Y. Yin

COMMITTEE ON RUSSIAN STUDIES

C.A. Linden, C.F. Elliott *(Chairman)*, A. Gyorgy, C.A. Olkhovsky, V. Petrov, R.B. Thompson, R. Thornton, H.B. Yakobson

COMMITEE ON WORK-STUDY AND INTERNSHIP PROGRAMS

R.L. Cole, D. Fischer, G.C. Mackenzie

INTRODUCTION

With the establishment in 1898 of the School of Comparative Jurisprudence and Diplomacy, the study of government was first organized as a separate entity in the University. In 1928, this School was reorganized and broadened as the School of Government. During the next two decades, programs in business administration and public administration were added, and the emphasis gradually shifted from undergraduate to graduate study. The name was changed in 1960 to the School of Government, Business, and International Affairs to reflect more accurately the offerings of the School. A division of the School was effected in 1966, and two schools were established—the School of Government and Business Administration, a primarily professionally oriented school, and the School of Public and International Affairs, a primarily policy-oriented school.

Programs of the School of Public and International Affairs are inter-

* The Dean of the School is an *ex officio* member of all committees.

disciplinary, and emphasize both domestic and foreign governmental policy.

Students in the freshman and sophomore years are registered in Columbian College of Arts and Sciences, the liberal arts college of the University, and are assigned special advisors from the School of Public and International Affairs to assist them in planning their programs.

Academic Programs

Programs available within the School of Public and International Affairs are undergraduate fields in Chinese Language and Literature, East Asian Studies (China or Japan), and Urban Affairs; undergraduate and graduate fields in International Affairs, Middle Eastern Studies, and Public Affairs; and graduate fields in East Asian Studies, Latin American Studies, Russian and East European Studies, and Science, Technology, and Public Policy. Special programs in Soviet, Far Eastern, and East European studies are offered by the School's Institute for Sino-Soviet Studies.

Objectives

Five undergraduate programs of study—East Asian Studies, Middle Eastern Studies, International Affairs, Public Affairs, and Urban Affairs—are aimed at preparing the student to understand major contemporary issues in international affairs or in domestic public affairs. The programs are designed not to produce narrow professional specialists, but to foster a liberal education, interdisciplinary in nature and broader than a concentration in one of the conventional disciplines. In each program there is double effort: to develop a background as broad and as deep as possible in order to assist in the understanding and analysis of modern problems and to give instruction in some useful tools of analysis. The program in Chinese language and literature is closer to the traditional liberal arts pattern, emphasizing language and culture.

The graduate programs leading to the degree of Master of Arts are more concentrated. The student is expected to develop a greater competence in an area or a discipline, building on the student's undergraduate program in preparation for professional employment in government, in international organizations, in business, or in private agencies concerned with public or international affairs.

REGULATIONS

Regulations concerning admission, registration, fees, and finances are stated on pages 20-32; other University regulations, on pages 44-52.

Attendance

Students may not attend classes until registration is completed and fees due are paid.

Students are held responsible for all the work of the courses in which registered, and all absences must be excused by the instructor before provision is made to make up the work missed.

A student suspended for any cause may not attend classes during the period of suspension.

Withdrawal

Withdrawal after the end of the fifth week of classes (fall or spring semester) without academic penalty is permitted only in exceptional cases (see "Withdrawal," page 46).

THE DEGREE OF BACHELOR OF ARTS

The School offers programs leading to the degree of Bachelor of Arts in the fields of Chinese Language and Literature, East Asian Studies (China or Japan), Middle Eastern Studies, International Affairs, Public Affairs, and Urban Affairs.

ENTRANCE REQUIREMENTS

The satisfactory completion of the Chinese Language and Literature, East Asian Studies, International Affairs, Public Affairs or Urban Affairs curriculum in Columbian College of Arts and Sciences (see pages 77-79), or the equivalent, is required.

GENERAL REQUIREMENTS FOR THE DEGREE

The following requirements apply to both the standard 120-semester-hour and the special 90-semester-hour programs. See page 167 for additional requirements for the 90-semester-hour program.

Academic Work Load

Normal academic work load for the full-time student is 15 semester hours. A student with a strong academic record may take up to 18 semester hours with the approval of the dean.

Scholarship Requirements

In order to graduate, a student must have the following: (1) 120 semester hours (or 90 semester hours if the student qualifies for the special 90-semester-hour program) of passing grades (courses in human kinetics and leisure studies cannot be included in the required hours); and (2) grades of *A* or *B* in four three-semester-hour courses in the major, to be taken in residence at George Washington University. The major includes the required second-group courses (101-200) and courses taken in the group options.

DEAN'S HONOR LIST

The name of every student who attains a 3.50 quality-point index* in course work is placed on the Dean's Honor List for that semester. Appearance on the list will be limited to (1) full-time students registered for a minimum of 12 semester hours and (2) part-time students registered for a

* See page 45 for explanation of the quality-point index

minimum of 12 semester hours over a period of two consecutive semesters, which may include a summer term.

ACADEMIC STANDING

A student who is not suspended or on probation is considered to be in good standing.

The rules below govern probation and suspension and are applicable as stated to students enrolled for a full-time program (12 semester hours or more) during the fall or spring semester or the three summer sessions. For students taking less than 12 semester hours in any one semester or summer session, these rules are applied on the basis of 12 or more hours taken during two or more semesters or summer sessions.

PROBATION

Students who in one semester receive two grades of F* in courses carrying three or more semester hours of credit each or the equivalent, are placed on probation. Those on probation who receive one grade of *F* in such a course will be continued on probation for a second semester. Those on probation taking 12 or more semester hours whose grades are all *C* or better are removed from probation.

SUSPENSION

The following three cases constitute ground for suspension: (1) three grades of *F** in courses carrying three or more semester hours of credit or the equivalent; (2) two grades of *F* when on probation; (3) one grade of *F* when in a second semester of probation.

Students who are suspended for poor scholarship may apply for readmission after the lapse of one fall or spring semester. To be considered for readmission, the student must pass prescribed tests and submit evidence to the Dean's Council of conduct during absence from the University which indicates that the student will profit from readmission. Students readmitted after suspension are on probation. Those who are still on probation after completing 24 credit hours, will be suspended. A student suspended twice for poor scholarship will not be readmitted.

INCOMPLETE/AUTHORIZED WITHDRAWAL

Conditions under which the grades of *I* (Incomplete) or *W* (Authorized Withdrawal) may be assigned are described on page 45.

Removing an Incomplete—The grade of *I* must be removed no later than the last day of the examination period for the fall or spring semester immediately following the semester or summer session in which the grade

* In determining whether a student is placed on probation or suspension, two grades of *D* are equated with one grade of *F*. Thus, for example, a student who receives one grade of *F* and two grades of *D* is placed on probation, and a student who receives two grades of *F* and two grades of *D* is suspended.

of *I* is assigned. An "Incomplete" that is not removed within this period is automatically changed to an *F*. In cases of well-documented extenuating circumstances, an instructor and a student may jointly petition the dean, or the appropriate committee, for additional time in which to complete the work of the course. Such petitions should be submitted within the same period. The grade of *I* cannot be removed by reregistering for the course here or by taking its equivalent elsewhere.

Residence

A minimum of 30 semester hours, including at least 12 hours in the major field, must be completed while registered in the School of Public and International Affairs. This requirement applies to students transferring within the University as well as to students transferring from other institutions. Unless special permission is granted by the dean to pursue work elsewhere, the work of the senior or final year must be completed in the School of Public and International Affairs.

Use of Correct English

Any student whose written or spoken English in any course is unsatisfactory may be reported by the instructor to the dean. The dean may assign supplementary work, without academic credit, varying in amount with the needs of the student. If the work prescribed is equivalent to a course, the regular tuition fee is charged. The granting of a degree may be delayed for failure to make up any such deficiency in English to the satisfaction of the dean.

Study Abroad

Students wishing to study abroad must consult with their advisors and the dean, because arrangements must be made on an individual basis. Students should receive the dean's approval, in advance, for their plan of study abroad if they plan to have the credits earned abroad apply to the degree program in which they are registered. A catalogue or other description of the foreign institution or study program should be presented for consideration together with detailed descriptions of the courses to be taken. Students of international affairs are encouraged to travel and study abroad.

Credit/No Credit Option

A student in the School of Public and International Affairs who has a cumulative quality-point index* of 2.5 or better may, with the approval of the advisor and the dean, take one course each semester and receive a grade of *CR*, Credit, or *NC*, No Credit, which will be recorded on the student's transcript but will not be reflected in the cumulative grade average. A student must sign up for such an option at registration. Under no circumstances may a student change from credit no credit status to graded status, or vice versa, after the end of registration. Courses in the student's major (except those in which the grade of *CR* or *NC* is normally assigned) may not be taken on a credit no credit basis. A transfer student

* See page 45 for explanation of the quality-point index

may not elect to take a course on a credit/no credit basis until the second semester of enrollment in the University. Students in the School of Public and International Affairs may take no more than six courses in which the grade of *CR* or *NC* is assigned including those in which the grade of *CR* or *NC* is normally given and those taken at any other college, school, or division of the University prior to transferring to the School of Public and International Affairs.

Correspondence and Home-Study Courses

Credit for correspondence or home-study courses is not acceptable and cannot be applied toward a degree.

Additional Requirements for the 90-Semester-Hour Program

Exceptional students may, when registered as freshmen or sophomores in Columbian College of Arts and Sciences, petition the dean of the School of Public and International Affairs for admission to a special 90-semester-hour degree program in the School of Public and International Affairs. Supporting evidence in the form of achievement test scores, College-Level Examination Placement (CLEP) scores, and grades earned at George Washington University or any other institution must be supplied. The dean, in consultation with the Dean's Council, will determine eligibility for admission to the program, which takes place when the student enters the School of Public and International Affairs at the beginning of the junior year.

In addition to the general and curriculum requirements, students in the 90-semester-hour program must fulfill the following requirements:

1. The student must receive grades of *A* in 50 percent of the total course work, and also in 50 percent of the courses required in the major.
2. The student must take at least 60 semester hours in courses beyond the first-group level (numbered above 100).
3. The 90 semester hours of credit must be earned in actual course work, i.e., credit through advanced placement, special examinations, etc., may not be counted in the 90 semester hours required for graduation.

Students who qualify for admission to the 90-semester-hour program are encouraged to begin taking second-group courses (numbered 101-200) as soon as they are qualified to do so, and should seek to obtain a waiver of course prerequisites in those disciplines in which they have a strong background.

CURRICULUM REQUIREMENTS

To be recommended by the faculty for graduation, candidates are required to complete, in addition to the appropriate freshman and sophomore work (see pages 77-79), a minimum of 60 semester hours during the junior and senior years, as set forth in one of the following curricula.

Earning Credit or Waiving Requirements by Examination

For information on earning credit or waiving curriculum requirements, see Columbian College of Arts and Sciences, pages 75-76.

Major Fields of Study

Requirements for the five major fields of study leading to the degree of Bachelor of Arts are listed below. Students should consult the appropriate department in the "Courses of Instruction" section of this *Bulletin* for complete course descriptions.

CHINESE LANGUAGE AND LITERATURE

Prerequisite—A minimum of 60 semester hours in Columbian College (see page 67) or the equivalent from another accredited institution.

Requirements for the Major—Chin 11–12, 109–10 and 163–64; plus 12 additional semester hours of second-group Chinese literature courses. The student is required to pass a major examination at the end of the senior year. The coordinated field of knowledge upon which the student will be examined includes an active command of modern Chinese language and a general knowledge of Chinese literature and culture. A preseminar (Chin 199–200) assists the student in preparation for the major examination.

Students in the Chinese language and literature program may study abroad in the junior year.

EAST ASIAN STUDIES (China or Japan)

The major in East Asian Studies is designed to introduce the student to a non-Western culture and to provide an understanding of the history, politics, and economy of modern China or Japan. The major is interdepartmental and is recommended for students who wish a comprehensive study of one of the world's major civilizations and for those who contemplate graduate study in Chinese, Japanese, or Far Eastern affairs.

A junior year abroad is available in this program of study for those interested in China. Students should contact the chairman of the Department of East Asian Languages and Literatures.

Prerequisite—The East Asian Studies curriculum, pages 77–78, including Chin 5–6 or Japn 3–4.

Requirements for the Major—(1) Chin 11 (China focus) or minimum of three additional hours of Japanese (Japan focus), and Chin 163 or 164; (2) Econ 169 (China focus) or 170 (Japan focus); (3) three semester hours selected from Geog 125, 126, 127, 152, 196 or 198; (4) nine hours selected from Hist 137, 187, 188, 189, 195, 196 (either Hist 187 or 196, but not both, may be selected); selection covering both pre-modern and modern periods encouraged; (5) three hours selected from PSc 177, 197, 198, or 199; (6) nine semester hours of course work in economics, history, or political science *not related* to China or Japan, to be selected in consultation with and approved by the advisor; six semester hours in research and writing seminar related to China or Japan and taken in discipline of concentration.

MIDDLE EASTERN STUDIES

The major in Middle Eastern Studies introduces the student to this region through interdepartmental studies.

Prerequisite—The Middle Eastern Studies curriculum, pages 77–78.

Requirements for the Major—(1) six semester hours of a third year of a

modern foreign language; (2) three hours of either religion or philosophy or literature of the Middle East; (3) three semester hours selected from Geog 125, 126, 127, 135, or Hist 30; six semester hours selected from Hist 107, 108, 109, 133, 136, 168A or 168B; (5) six semester hours selected from PSc 177, 178, 179, or 180; (6) nine semester hours of upper-level undergraduate history, political science, or religion courses relating to the Middle East, to be selected in consultation with and approved by the adviser; six semester hours of research and writing (master's essay) related to the Middle East and taken in the discipline of concentration.

INTERNATIONAL AFFAIRS

The major in International Affairs enables the student to specialize in international political relations, international economics, international communications, or regional studies.

Prerequisite—The International Affairs curriculum, page 77.

Requirements for the Major—(1) Four 101–102 (2) six semester hours of a third year of foreign language (may be a literature course taught in the language); (3) three semester hours selected from Geog 125, 126, 127, 135, 145, 146, or 161; (4) Hist (not 130) or 137, and 102; (5) PSc 140 and 142 or 144; (6) 45 semester hours from one of the groups outlined below.

Group I. International politics—courses concerned with theory and practice in international affairs, foreign systems (the world scene and American foreign policy), selected from Geog 145, 146, 147, 149, 161 (if not elected to satisfy the major requirement); Hist 107–108 or 168–168; PSc 165–6, 167, 168, 172, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215,

Requirements for the Major—(1) Econ 101, 161, 162; (2) Hist 175–76; (3) PSc 114 or 115, 116 or 117, 119; (4) 12 semester hours from one of the group options listed below:

Group I. Economics—courses selected from Econ 102, 104, 121, 122, 123, 136, 142, 165, 181–82.

Group II. Politics—courses selected from PSc 106, 110, 111, 112, 116 (if not taken as a major requirement), 118, 120, 121, 122, 124, 130, 146.

Group III. Urban affairs—courses selected from BAd 174; Econ 157; Geog 140, 141, 142; PSc 111, 112; Soc 126; U&RP 153.

URBAN AFFAIRS

The Urban Affairs program is designed for undergraduates interested in urban-related occupations, in furthering their knowledge about theories and findings related to urban life, or in acquiring the tools that will help them to effectively apply themselves to the task of devising solutions to the problems that cities and their residents face. The program consists of a focused set of courses that introduces the student to the problems and issues of urban America from the perspectives of various social science disciplines.

The central focus of the program is on urban public policy—the various forces that shape it, and its adequacy relative to current and anticipated needs. Within the overall framework, students can specialize in either the political and social, economic and financial, design, or research methodological aspects of urban studies. In the senior year each student serves an internship in an urban-related agency or research organization and also attends a weekly seminar restricted to urban affairs majors. Each student is encouraged to work closely with the urban affairs advisor to develop a program tailored to personal interests and goals.

Prerequisite—The Urban Affairs curriculum, pages 78–79.

Requirements for the Major—(1) Urban Affairs core courses: Econ 157; Geog 140; Hist 186; PSc 101, 111, 112; and one course chosen from among Stat 51, 53, or 111; (2) Special Urban Affairs fields: each student will be required to take four courses from within one of the following four fields of specialization, and two courses from each of the others. Field A. (Urban Research Methods): Stat 51, 53, or 111; Stat 112, 97, 105, 117, 123; Acct 115. Field B. (Political and Social Urban Analysis): PSc 104, 111, 113, 124; Soc 126; Soc-Econ 154; PAd 250. Field C. (Urban Economics and Financial Analysis): Econ 101, 161, 162, 165, 136; BAd 113. Field D. (Urban Design and Spatial Analysis): AmCiv 227; Geog 141, 142, 143; U&RP 153, 201. (3) Senior Internship and Seminar: PSc 188 and 193—the grade of *CR* (Credit) or *NC* (No Credit) will be given for PSc 188. A student may elect to fulfill the internship requirement in a paid position in lieu of registering for PSc 188, however, the student must substitute six semester hours of elective course work.

THE DEGREE OF MASTER OF ARTS

This School offers programs leading to the degree of Master of Arts in the major fields of East Asian Studies, International Affairs, Latin American Studies, Middle Eastern Studies, Public Affairs, Russian and East European Studies, and Science, Technology, and Public Policy.

ADMISSION REQUIREMENTS

Application forms are available from the Graduate Admissions Office, School of Public and International Affairs, George Washington University, Washington, D.C. 20052.

A bachelor's degree from an accredited college or university, with a *B* average or better, or the equivalent, in the relevant undergraduate major, is normally required. If there is evidence of special promise, such as high Graduate Record Examination scores, an applicant whose academic record falls short of *B* will be given serious consideration. Scores on the Aptitude Test of the Graduate Record Examinations as well as letters of recommendation are required.

In East Asian Studies—An undergraduate major in a pertinent field is required. For the concentration in Chinese language and literature, the undergraduate program should include 24 semester hours of Chinese language study.

In International Affairs—The applicant's undergraduate program should include background courses corresponding to the interdepartmental undergraduate major in international affairs at this University (see page 169), or some other relevant social science program. In the case of major deficiencies in the social sciences or international relations, additional course work may be specified beyond the minimum requirements for the master's degree. The student's particular responsibilities will be indicated in the letter of admission to the program and in the course of subsequent consultation with an assigned faculty advisor.

In Latin American Studies—The applicant's undergraduate program should include background courses corresponding to an undergraduate major in Latin American Studies at this University (see page 360) or equivalent. Majors in other fields may be considered for admission provided their undergraduate course work includes Spanish or Portuguese and sufficient course work in three of the following six areas: anthropology, economics, geography and regional science, Hispanic literature, history, and political science.

In Middle Eastern Studies—The applicant's undergraduate program should include background courses corresponding to an undergraduate major in Middle Eastern Studies at this University (see pages 168-69) or equivalent.

In Public Affairs—An undergraduate major in public affairs, economics, history, or political science, depending upon the field of specialization in the master's program, is required. Students entering the program are assumed to have had some college-level course work in American government and politics, American history, and economic theory. To the extent that a student lacks such a background, the student must, in consultation with an advisor, undertake the appropriate remedial course work, including some courses which may be taken for graduate credit.

In Russian and East European Studies—An undergraduate major in a pertinent field is required. The undergraduate program should include the following courses, or equivalent: Hist 145, 146; PSc 131; Slav 1–2 and 3–4, or 5–6.

In Science, Technology, and Public Policy—Undergraduate majors in a social, life, or physical science, or in engineering are eligible for admission, although those lacking adequate preparation in relevant social sciences,

particularly examinees, may be required to take additional courses; such requirements will be indicated in the letter of admission to the program.

Readmission

A graduate student who has not been continuously enrolled or on approved leave of absence as inactive status must file an application for readmission the semester before planning to return to school. Applications for readmission are reviewed by the dean and the Committee on Admission.

GENERAL REQUIREMENTS

There are two options available in all fields (except Chinese language and literature) in which only a thesis program is available) leading to the Master of Arts degree. One requires a minimum of 24 semester hours of approved graduate work plus the successful completion of a thesis; the student must register for six semester hours of *Thesis Research* (299-300). The second option requires a minimum of 30 semester hours of graduate course work and does not include a thesis. The course work for both options is taken in preparation for the Master's Comprehensive Examination.

Candidates for the degree of Master of Arts are required to submit an adviser-approved "Program of Studies" (comprehensive fields, supporting course work, tool requirement, etc.) to the office of the dean by the end of the first semester in residence.

Master's degrees are awarded by vote of the Faculty after the student has completed the required course work and an acceptable thesis (if one is elected), has satisfied the foreign language or tool requirement, and has passed the Master's Comprehensive Examination.

Under specific circumstances second-group courses (numbered 101-200) may be counted toward the master's degree when registration for graduate credit has been approved at the beginning of the course by the curriculum advisor, the instructor and the dean. The student who takes an undergraduate course for graduate credit is expected, by arrangement with the instructor, to do work at the graduate level in addition to the regular work of the course. Normally, no more than six semester hours of second-group courses may be taken for graduate credit in the 30-semester-hour program, and no more than nine semester hours may be taken for graduate credit in the 36-semester-hour program. (The one exception to this rule is the case of students who select one or more fields in history; they may take nine hours of second-group courses in the 30-hour program and 12 in the 36-hour program.) No work counted toward a bachelor's degree may also be counted toward a master's degree.

All work for a master's degree must be completed in five years, unless an extension of time is granted by the dean. A student who is temporarily unable to continue the program of studies may request a leave of absence not to exceed one year.

No credit is granted for work done *in absentia* or without formal instruction, except for the thesis, which may be completed *in absentia* with the permission of the curriculum advisor and the dean. No more than six semester hours of graduate credit may be transferred from other accredited institutions or another division of the University, and these may

be accepted only under limited conditions of time, grades, and relevance to the student's program.

A student who expects to continue studies for the degree of Doctor of Philosophy in the field of International Relations after receiving the master's degree in the field of International Affairs is strongly advised to plan from the beginning so that work for the lower degree will fit into a subsequent doctoral program in the Graduate School of Arts and Sciences (see pages 88-92, 97-99).

Tool Requirements

In most programs of study a candidate for the degree of Master of Arts must demonstrate a reading knowledge (certified by the appropriate language department) of at least one modern foreign language, to be approved by the dean. A master's degree candidate whose native language is not English may not select the native language to meet the tool requirement; the candidate may select English to fulfill the requirement with the approval of the advisor and the dean. The examination, which will test high-level reading and writing proficiency, is administered by the English for International Students program.

Candidates in the field of Public Affairs and in the field of Science, Technology, and Public Policy may substitute statistics for a foreign language. This requirement may be met by demonstration of proficiency at the level of Stat 105, 112, or 197.

Candidates in the field of International Affairs may petition the dean to substitute statistics for a foreign language. The primary basis for approving such petitions will be the relevance of the statistical skills to the student's thesis research.

The language or tool examination should normally be taken before the student has completed the first 15 hours of work. No student may take the examination more than three times.

Courses taken to fulfill the tool requirement are not counted in the semester-hour requirement for a master's degree.

Master's Comprehensive Examination

In addition to any course examinations, the candidate must pass a written Master's Comprehensive Examination. Examinations are scheduled twice a year (usually in November and April), and should be taken during the last semester of course registration or shortly after the completion of the prescribed course work. If there is a lapse of time between completion of course work and the examination, the student must be enrolled continuously during this period. The candidate must consult with the advisor, well in advance, as to the date of the examination and the definition of the subject-matter fields which this examination is to cover. It should be understood, however, that course work constitutes only partial preparation for the Master's Comprehensive Examination. Each student is also expected to pursue a program of additional reading in each of the selected fields, in accordance with the advice of the faculty member responsible for instruction in that field. An oral examination on the thesis or major report may also be required.

Scholarship Requirements

Grades for graduate work are *A*, Excellent; *B*, Good; *C*, Minimum Pass; *F*, Fail; *I*, Incomplete; *W*, Authorized Withdrawal; and *CR*, Credit.

An average of *B* or better is required for the master's degree. The grade of *C* is not considered as failing but must be counterbalanced by a grade of *A* in a graduate course of equal status.

A master's candidate who receives a grade of *F* is required to present cause for consideration by the Dean's Council as to why the student should be allowed to continue in the program of studies.

Whenever a grade has not been assigned, the symbol *I* (Incomplete) or the symbol *W* (Authorized Withdrawal) will be recorded. The symbol *I* indicates that a satisfactory explanation has been given to the instructor for the student's failure to complete the required work of the course. Except for thesis research courses, an "Incomplete" cannot be made up after the lapse of one calendar year. An "Incomplete" which is not removed by the end of one calendar year remains as a grade of *I* on the student's record. An "Incomplete" cannot be removed by reregistering for the course. No student will be permitted to register for courses in a new academic year if there are more than two "Incompletes" outstanding on the record.

The Thesis

The thesis subject should be selected as early as possible so as to permit effective integration with the course work. A student will not be permitted to register for Thesis Research (299-300) until the thesis subject has been formally submitted in the Dean's Office. The subject must be approved by the student's adviser and the member of the Faculty under whom the thesis is to be written. The thesis in its final form must have the approval of the thesis director and one other reader, and two copies must be presented to the dean by the student no later than the date announced in the Calendar. Printed copies of detailed regulations regarding the form and reproduction of the thesis are available in the Dean's Office.

Payment of tuition for the thesis entitles the candidate, during the period of registration, to the advice and direction of the thesis director and the other reader. In case a thesis is unfinished, the student must maintain continuous enrollment, not to exceed one calendar year, by registering for at least one credit hour per semester. If the preparation of the thesis exceeds beyond the additional calendar year, the student must register for the entire six hours of thesis again and pay tuition as for a repeated course.

Fields of Study

Specific requirements for each of the seven fields of study leading to the degree of Master of Arts are listed below. For prerequisites, see "Admission Requirements," pages 171-72.

EAST ASIAN STUDIES

The Master of Arts in the field of East Asian Studies is an interdisciplinary program which includes course work from at least four of the following

disciplines: Chinese language and literature, economics, geography, history, and political science.

The degree program consists of 30 semester hours of course work, including six hours of thesis research, or 36 semester hours of course work without a thesis. Each candidate must pass a Master's Comprehensive Examination in one major and one or two minor fields. To fulfill the tool requirement candidates must demonstrate proficiency in either Chinese or Japanese language; with the permission of the dean, another East Asian language may be substituted. (As preparation for this requirement, a special Chinese language course will be available to students in the program.)

Only the 30-semester-hour thesis option is available to students selecting a concentration in Chinese language and literature. That program includes 12 semester hours of Chinese language and literature, six hours of history, six hours of electives selected in consultation with the advisor, and six hours of thesis research.

INTERNATIONAL AFFAIRS

The interdisciplinary program leading to the degree of Master of Arts in the field of International Affairs provides the student with a wide choice of fields within three broad areas of study: general, supplemental or special, and regional. Graduate courses in anthropology, business administration, economics, geography and regional science, history, political science, psychology and sociology relate to these fields, which are listed below:

General Fields of Study—International politics, comparative government and politics, modern political theory (including socialist and communist theory) and international economics.

Supplementary or Special Fields—International law; international organization and administration; international economic development; international and comparative aspects of communism; U.S. diplomatic history; U.S. foreign policy; science, technology, and public policy; 20th century British defense and foreign policy; and U.S. national security policy.

Regional Fields—Modern history, or government and politics, or economic history and problems of one of the following: Western Europe, Eastern Europe, the Soviet Union, Latin America, the Middle East, Africa, South and Southeast Asia and China. Within each geographical area there are normally three fields of study available.

Each degree candidate must select at least one general field. The fields should also represent at least two disciplines. Beyond these limits, the student is free to select any of the fields indicated above as long as they comprise a coherent program. Courses should be chosen with a view to their relevance to the selected fields. Candidates will be examined on their selected fields of study in the Master's Comprehensive Examination.

Candidates who elect to write a thesis must choose *three* of the listed fields and take, in addition to the thesis, a minimum of 24 semester hours of graduate course work in at least two departments, with no more than 15 hours in any one department.

Candidates electing a program without a thesis must choose four fields and may take no more than 21 of their required 36 semester hours in one department. They must also include in their program at least two re-

search seminars (six semester hours) requiring the preparation of substantial research papers.

LATIN AMERICAN STUDIES

The program leading to the degree of Master of Arts in the field of Latin American Studies is designed to provide the student with an appropriate area background in three or four of the following fields: anthropology, economics, geography and regional science, Hispanic literature, history, and political science.

All degree candidates must complete 12 semester hours of graduate work, including the interdisciplinary seminar (287). In a major field selected from those listed above, and six semester hours in each of two minor fields selected from those listed above. Students who elect not to write a thesis must take six semester hours in a third minor field selected from those listed above, or from the fields of urban and regional planning, economic development or population studies. The student must further complete an additional six semester hours in any of the major or minor fields selected. The tool requirement must be satisfied by demonstration of proficiency in Spanish or Portuguese, or in English if the student's native language is Spanish or Portuguese. The Master's Comprehensive Examination will cover all the student's selected fields.

MIDDLE EASTERN STUDIES

The interdisciplinary program leading to the degree of Master of Arts in the field of Middle Eastern Studies offers the student an appropriate area background in three or four of the following fields: domestic politics, international relations, history, economics, geography and regional science, anthropology, religion, philosophy, arts and literature. One approved field from the international affairs curriculum may also be included.

The degree program consists of 30 semester hours of course work including six hours of thesis research or 36 semester hours of course work without a thesis. In the 30-hour program, students select one major and two minor fields; in the 36-hour program, students chose one major and three minor fields. Written Master's Comprehensive Examinations in these fields will be required of all candidates at the completion of the degree program. All students must meet the prescribed basic preparation of three credit hours in Middle Eastern international relations, domestic politics, and modern history, and must satisfactorily complete the interdisciplinary seminar offered by this program. To fulfill the tool requirement, candidates must demonstrate reading knowledge proficiency in an approved modern Middle Eastern language.

PUBLIC AFFAIRS

The program leading to the degree of Master of Arts in the field of Public Affairs allows the student to specialize in either domestic economics or domestic politics. The student may select courses in consultation with an advisor to emphasize either political science, economics, or American

history, provided (1) that no more than 15 hours of courses are elected in one department under the 24-hour program with a thesis, or (2) that no more than 21 hours are elected in one department under the 36-hour program without a thesis. Course work may include economics (public finance, monetary theory and policy, labor economics, industrial organization, natural resources and environmental economics, regional and urban economics, economic policy); history (U.S. political history, U.S. economic history, recent U.S. history); political science (domestic politics and government, Congress and the presidency, U.S. constitutional law and politics, state and urban politics, political science research methods, and science, technology, and public policy).

RUSSIAN AND EAST EUROPEAN STUDIES

This degree program is designed to give the student a broad grasp of Russian affairs on an interdisciplinary basis, with emphasis on the Soviet era. At the same time, the program provides an opportunity for students to gain knowledge of a special area of interest within the subject matter as a whole.

Required for the degree: 30 semester hours including a thesis, or 36 semester hours without a thesis. Each candidate prepares for a Master's Comprehensive Examination in one major and two minor fields chosen from the areas of internal affairs, foreign relations, political thought and theory, literature and culture, and economics and geography. Russian language proficiency must be demonstrated in a reading comprehension examination before the Master's Comprehensive Examination is taken.

SCIENCE, TECHNOLOGY, AND PUBLIC POLICY

The program leading to the degree of Master of Arts in the field of science, technology, and public policy is flexible and is carefully planned and conducted in consultation with an advisor. All degree candidates are required to take 12 semester hours in the core field of science, technology, and public policy, which includes course work both in science policy and in policy analysis. A second field must be chosen from one currently offered in the international affairs or public affairs programs of the School. Students who elect to write a thesis must select one additional field, and those who elect not to write a thesis must select two additional fields. The third and fourth fields may also be chosen from those currently offered in international affairs or public affairs, or may be interdisciplinary, developed in consultation with the advisor and focusing on a particular policy issue or area. Such a special field must be approved by the student's advisor and the dean.

SPECIAL PROGRAMS

Combined Master of Arts and Juris Doctor Degree Program

The School of Public and International Affairs cooperates with the National Law Center in offering a program leading to the combined degrees of Master of Arts and Juris Doctor. A student must be accepted for ad-

mission by both the School of Public and International Affairs and the National Law Center. Applications should be made separately, but at the same time. Both the School and the Center should be notified that the student is interested in the combined program. The student will be admitted to the School of Public and International Affairs for the academic year following the first year of study at the National Law Center, since the National Law Center stipulates that the first year of coursework for the Juris Doctor degree must be taken as a unit.

The Master of Arts degree program normally consists of the 30-semester-hour program which includes a thesis. The student selects a major offered by the School and fulfills all of the requirements for the Master of Arts degree as well as fulfilling the requirements for the Juris Doctor degree. Up to six semester hours of credit for course work completed as part of the Juris Doctor curriculum and related to the student's degree program may be approved for transfer toward the Master of Arts degree. (Some of the course work required for the Master of Arts degree program may be applicable toward the Juris Doctor degree requirements.) Students will be registered in both the School of Public and International Affairs and the National Law Center and must maintain this concurrent registration until all degree requirements have been completed. All work for this combined degree program must be completed in five years, unless an extension of time is granted by the dean.

Institute for Sino-Soviet Studies

The Institute for Sino-Soviet Studies provides a program of specialized graduate study and research within the School of Public and International Affairs. Courses of the Institute are drawn from a variety of academic areas and thus provide an interdisciplinary approach to the study of the Soviet Union, Eastern Europe, and East Asia, and of the Communist movement within and among the countries of these areas. Faculty members conduct seminars and reading courses in the disciplines of economics, geography, history, language and literature, law, political science, and psychology. Research work is integrated with the teaching program.

Students who are preparing for the degree of Master of Arts in the fields of East Asian studies, international affairs, and Russian and East European studies in the School of Public and International Affairs, or for the degree of Master of Arts in the fields of economics, history, or political science in the Graduate School of Arts and Sciences, with specialization in Sino-Soviet studies, may take course work from the Institute's offerings.

Students working toward the degree of Doctor of Philosophy in international relations with special emphasis on the Sino-Soviet area are expected to combine work in the Institute with work in the fields of economics, history, and political science. Doctoral candidates in the field of political science will take their Sino-Soviet work in the form of appropriate subfields of the major and minor fields. Doctoral candidates in the field of history are expected to take at least two of the four fields for the degree in the history of the countries of their specialization. All work leading to the degree of Doctor of Philosophy is under the general supervision of the Graduate School of Arts and Sciences and consultative committees designated by that School which direct the work of each graduate student.

upon admission to degree candidacy. A faculty member of the Institute will serve as advisor to the candidate. The candidate's committee will be formed from members of the selected disciplinary department. A candidate for such a degree should assume that the committee will require the substitution of a reading examination in Chinese or Russian for one of the two Western languages normally required for the degree.

A brochure describing in more detail the work of the Institute is available upon request.

DIVISION OF UNIVERSITY STUDENTS

Dean J.G. Allee, Jr.
Assistant Dean B.K. Netland

DEAN'S COUNCIL[a]

J.G. Boswell, H. Kenyon, R.W. Kenny, L.F. Robinson

INTRODUCTION

The Division of University Students was established in 1930 to make the regular course offerings of the University more generally available to members of this metropolitan community and to others who are not at the time candidates for degrees in this University. In this Division are registered students who wish to undertake university courses for credit or as auditors. University Students, often employed in government or industry, may be taking courses to increase their vocational fitness or to inform themselves on new developments in the arts and sciences. They may be taking courses as a matter of personal interest for cultural enrichment. Such students may be candidates for higher degrees in other institutions, sent here for special work as part of a graduate program. They may be undergraduates, matriculated in other colleges, taking summer sessions courses only or courses for transfer during the regular academic year with the approval of their own institution. They may be students from institutions outside the Washington metropolitan area enrolling in an appropriate "Washington Semester" program. To serve members of such groups and others not enrolled in degree granting branches of the University is the function of the Division of University Students.

The privilege of attending George Washington University as a non-degree student is granted on the basis of maturity and proper preparation. Because no degree at George Washington University is involved, there can be no meaningful advisory system in the Division. However, students

[a] The Vice President for Academic Affairs and the Dean and Assistant Dean of the Division are ex officio members of the Council.

are invited to seek advice from academic departments. University students are urged to apply for transfer to degree-granting branches whenever such action is appropriate.

All courses except those restricted to medical and law students are open to students enrolled in the Division of University Students, provided that they have sufficient preparation as determined by the academic departments. Students wishing to take Engineering and Applied Science courses should consult the *School of Engineering and Applied Science Bulletin*.

Registration in a given course may be denied students in this Division when space is needed for degree candidates. Students in this Division are not eligible to register for thesis or dissertation research.

Applicants who have been denied admission to any degree-granting branch of the University may be considered for admission to the Division of University Students for other areas of study. Except upon written recommendation of the department chairman, such applicants will not be admitted through this Division in the same area of study and for the same semester for which they were denied. However, this restriction is lifted from applicants filing in subsequent semesters.

Nondegree students who have not completed a bachelor's degree may not enroll in graduate courses offered by the School of Government and Business Administration.

An applicant who has been suspended from any educational institution for poor scholarship will not be considered for admission to the Division of University Students for one calendar year after the effective date of the suspension.

ENTRANCE REQUIREMENTS*

An academic background appropriate for the program of studies contemplated is required.

A person not working for a degree at this University will be considered for admission to the Division of University Students to take courses for which the applicant has adequate preparation, as determined by the departments concerned.

Although the deadline for applications for admission to the Division of University Students is the Friday before the first day of registration (see pages 5-7), applicants are urged to apply earlier because no special exceptions can be made to permit registration after the last day for adding classes (the end of the first week of classes) even though the requiring of credentials, records, and test scores may delay the action on an application for admission. Insofar as time for full processing permits, applications submitted after the deadline may be considered.

Applicants who have graduated from high school within the previous two calendar years must pass designated aptitude tests or submit (1) a certificate of graduation from an accredited secondary school showing at least 15 units† including four years of English; at least two years

* For admission requirements for students from foreign institutions, see pages 25-26.

† A unit represents a year's study in a secondary school subject, including in the aggregate not less than 120 sixty minute periods, or the equivalent, of prepared classroom work.

one foreign language; two years of science, preferably with laboratory instruction; two years of social studies, one of which must be American history; and two years of college preparatory mathematics; (4) the principal's statement that the student is prepared to undertake college work; and (5) scores on the College Entrance Examination Board's Scholastic Aptitude Test and English Composition Achievement Test. In addition to these requirements, applicants who have been subject to any form of academic or disciplinary action at any college or university during the previous calendar year must submit scholastic records from such college or university. Applicants for the Secondary School Honors Program and applicants who have not completed high school or the equivalent must submit scholastic records and may be required to take designated aptitude tests.

Scholastic records may be required of applicants who have attended any college or university within the previous calendar year, former students of this University who were on probation or suspended and who have since attended another college or university, and applicants who have ever been subject to academic or disciplinary action. When scholastic records are required, such students may be admitted for one semester or summer term only, under provisions stated by the Office of Admissions and pending receipt of academic records.

REGULATIONS

Regulations concerning admission, registration, fees and finances are stated on pages 30–43; other University regulations on pages 44–52.

Prospective and registered students are urged to acquaint themselves with the regulations concerning attendance (see page 44) and withdrawal (see page 46).

The following specifically apply to all students in the Division of University Students:

Last day to add a class for credit—end of first week of classes.

Last day to drop a class for credit or withdraw from the University—end of the ninth week of classes.

Equivalent amounts of time apply to the summer sessions.

Academic Work Load

The normal academic work load is not more than 16 hours for a student employed more than 20 hours a week and not more than 18 hours for a full-time student. Hours for courses graded I, "Incomplete," will be included in subsequent academic work loads. Exceptions to these limits may be approved by the dean.

Scholarship Requirements

A student who fails to maintain the scholarship requirements of this Division may be dismissed from the University.

Normally, any course may be repeated for credit. All grades received in the Division of University Students remain on the record, and scholarship requirements are based on the total record. A course taken for audit may not be repeated for credit.

GRADES

Undergraduate—*A*, Excellent; *B*, Good; *C*, Satisfactory; *D*, Low Pass; *F*, Fail; *I*, Incomplete; *W*, Authorized Withdrawal.

Graduate—For graduate work, grades are indicated as *A*, Excellent; *B*, Good; *C*, Minimum Pass; *F*, Fail; *I*, Incomplete; *W*, Authorized Withdrawal.

The credit/no credit option, which permits students to take courses in which they receive the grade of either "Credit" or "No Credit," is available to students registered in the Division of University Students.

INCOMPLETE/AUTHORIZED WITHDRAWAL

Conditions under which the grades of *I* (Incomplete) and *W* (Authorized Withdrawal) may be assigned are described on page 45.

Removing an Incomplete—Although the grade of *I* may remain on the student's record indefinitely, the instructor should normally set a period (maximum of one year) within which the uncompleted work (usually the final examination or a required paper) must be made up. The grade of *I* cannot be removed by reregistering for the course here, or by taking its equivalent elsewhere. An "Incomplete" cannot be made up after the lapse of one calendar year except by written permission of the Dean's Council. An "Incomplete" which is not removed within one calendar year remains as a grade of *I* on the student's record.

PROBATION AND SUSPENSION

A student not holding a degree is subject to the probation and suspension regulations of Columbian College of Arts and Sciences (see page 69).

A student holding a degree must maintain a 3.00 average in all courses taken for graduate credit. If the cumulative index in such courses falls below 3.00, the student will be placed on probation. If the cumulative index falls to 2.25 or below, the student will be suspended. The scholarship regulations for courses taken for undergraduate credit are the same as those of Columbian College of Arts and Sciences.

A suspended student will not be permitted to register for any course work, either for credit or for audit, in the Division during the period of suspension.

Changes in Program of Studies

Changes within the Division of University Students—A student may not change or drop courses (see "Withdrawal," page 46) or change status to that of auditor except with the approval of the dean.

Change from one section to another of the same course may be made with the approval of the dean and the department concerned.

Transfer within the University—Transfer to or from the Division of University Students may be made only with the approval of the deans concerned.

Application for transfer to degree candidacy will be considered only after the completion of at least one semester in the Division of University

Students or upon request from the college or school to which the student is seeking admission.

The student wishing to transfer to degree candidacy must meet the conditions of the college or school to which the student is applying. It is the responsibility of the student to consult the relevant degree-granting college or school concerning all conditions to be met and the amount of work transferable.

SECONDARY-SCHOOL HONORS PROGRAM

The outstanding secondary-school student in the Washington metropolitan area who wishes to enrich an academic background and participate in stimulating college work is encouraged to seek admission to George Washington University's Secondary-School Honors Program. Honors Students are enrolled in regular college courses of their own choosing appropriate to their level of study, background, and aptitude as determined through consultation with high school counselors and advisors at the University.

Credit earned in the Program is applicable toward a degree at George Washington University should the student later matriculate here. The transfer of credit elsewhere depends upon the policies of the individual schools to which the student might later apply.

Admission to the Honors Program is highly competitive. Normally, only 15 students a semester will be admitted to this Program, and each student will receive a scholarship totaling 50 per cent of tuition (excluding laboratory and University Center fees). Admission is for one semester only, but students doing well will be given preference for continuation and may be readmitted for a second semester. Criteria for admission are based on a transcript of the student's grades to date, available test scores, evidence of emotional and intellectual maturity, and the results of an interview with the director.

Application forms and further information may be obtained from B. K. Netland, Director of the Secondary-School Honors Program, Division of University Students, George Washington University, Washington, D.C. 20052. No applications will be considered after the Friday before the final day of registration for the semester concerned. For application for the summer session see the *Summer Sessions Schedule*

DIVISION OF EXPERIMENTAL PROGRAMS

Director R.S. French

The University is committed to the continuous development of new curricular options for its faculty and students. The Division of Experimental Programs has as its function the support of such curricular experimentation and development. This University-wide curricular development program has three objectives: (1) cooperation among the academic divisions of the University in the development and sponsorship of new courses and programs; (2) experimentation with new ways of teaching and learning; and (3) a more direct relationship between campus and off-campus resources and interests. In pursuit of these objectives the Division awards faculty fellowships for interdisciplinary research, sponsors student-faculty seminars for interdisciplinary education, and regularly organizes regional conferences on educational issues. The Division supports an annual conference on local history and publishes a monograph series, *GW Washington Studies*.

Under the auspices of the Division of Experimental Programs, students, faculty, and administrators throughout the University are involved in the planning, teaching, and evaluating of experimental courses and degree programs. Many curricular experiments which receive financial support through the Division of Experimental Programs are sponsored by other academic units of the University. There are presently two academic programs directly sponsored by the Division—the Program in Experimental Humanities and the Service-Learning Program.

The Program in Experimental Humanities offers courses which provide opportunities for students to combine sustained field study with classroom work. These courses are sometimes taught by interdisciplinary and interdivisional faculty teams. Some Experimental Humanities courses are residential courses in which students enrolled in the same class also live together in designated areas of university housing.

The Service-Learning Program integrates off-campus, preprofessional work placements with classroom seminars. Students in the program are placed in community groups, research organizations, or governmental agencies. Assignments are arranged by means of a formal agreement among the student, the program, and the off-campus placement. Instructors in the seminars are members of the faculty in one of the professional schools of the university.

The Division of Experimental Programs is charged with mobilizing academic resources throughout the University that can appropriately address needs in the Washington metropolitan community. Among the activities of the Division is a community assistance program in the Anacostia area. Selected students receive stipends for services to residents and work with community organizations.

ASSOCIATES

Linda Lear, *Assistant Director*
Perry Wallace, *Assistant Director*

Allan Fitzsimmons, *Faculty Associate for Environmental Studies*
Margot Kernan, *Faculty Associate for Film Studies*
D. Joanne Lynn, *Faculty Associate for Humanities and Medicine*
Colin Turnbull, *Faculty Associate for Community Studies*

STEERING COMMITTEE

Harold Frederick Bright, *Provost and Vice President for Academic Affairs,* **Chairman**
Lawrence Thompson Bowles, *Dean for Academic Affairs of the Medical* **Center**
Marcella Brenner, *Professor of Education*
Carl James Lange, *Associate Professor of Psychology; Assistant Vice Presi-* ***dent for Administration and Research***
Norma Maine Loeser, *Professor of Business Administration; Dean of the School of Government and Business Administration*
Ralph Clarke Nash, *Professor of Law*
Judith Ann Abrams Plotz, *Associate Professor of English*
Henry Solomon, *Professor of Economics; Dean of the Graduate School of* ***Arts and Sciences***

THE SUMMER SESSIONS

Dean W.F.E. Long
Assistant Dean S.R. Paratore

During the summer of 1979, Columbian College of Arts and Sciences, the Graduate School of Arts and Sciences, the School of Government and Business Administration, the School of Public and International Affairs, the School of Engineering and Applied Science, the Division of University Students, and the School of Medicine and Health Sciences offer courses in one three-week session (May 14-June 6) and two five-week sessions (June 11-July 17 and July 19-August 23). The National Law Center offers courses in two six-week sessions and one 13-week session; the School of Education and Human Development offers courses in six- and nine-week sessions and three three-week workshop sessions. The University also offers special programs during the summer which are not available during the regular academic year. Courses are offered during both day and evening hours.

Students who are enrolled at the University for the 1979 spring semester may register for the Summer Sessions without special application. All others must apply for admission or readmission. Those who do not wish to work toward a degree at the University may apply through the Division of University Students to take courses for which they are academically pre-

pared (as determined by the departments concerned). Students who wish degree status may seek admission from the appropriate college or school within the University, and must meet the stated entrance requirements.

For a complete statement concerning summer term work, see the *Summer Sessions Schedule*.

POLICY STUDIES AND SPECIAL PROJECTS

Vice President for Policy Studies and Special Projects L.H. Mayo

The Vice President for Policy Studies and Special Projects is responsible to the President of the University for developing an interdisciplinary capability for analyzing national policy issues. There is involvement with the Consortium universities and with foundations, federal agencies, industry, and other organizations which interact with the governmental process.

The office serves the University as a locus for discussion and as an advisory resource on interdepartmental and interdisciplinary research related to the analysis of public policies, and on curricula pertaining to broad social or environmental problems.

The University has sustained an institutional commitment, in terms of faculty recruitment and program emphasis, to issue-oriented policy analysis as a major focus of teaching and research activities. The result of twelve years of development is a significant, institutional capability for comprehensive analysis of complex policy issues. Major programs oriented to public policy and governmental functions, which come within the ambit of this office, are described below.

PROGRAM OF POLICY STUDIES IN SCIENCE AND TECHNOLOGY

Director L.H. Mayo

The Program's primary objective is the continuing development of a University-wide policy research capability related to problems stemming from the impact of technological change on the processes, values, and institutions of society. The Program provides a neutral forum for consideration of these policy issues—whether in a retrospective, current, or prospective context—and provides an advisory and research resource for policy makers in the public and private sectors.

The Program's primary components are:

1. *The Technology Assessment Group*—The Program has been closely involved with the evolution of the concept of Technology Assessment (TA), which has become federally institutionalized in the Congressional Office of Technology Assessment. Much of the early work of the Program

consisted of theoretical, methodological, institutional, and historical studies. During the last six years, however, the TA Group has carried out studies in a variety of subject areas including transportation, energy, community development, environmental noise, communication, and governmental structure and process, under contracts or grants from most of the major Federal agencies.

2. *The Graduate Program in Science, Technology, and Public Policy*—This Master's degree program—co-sponsored by the Program of Policy Studies and the School of Public and International Affairs (SPIA)—combines graduate training in science policy analysis with major research undertakings. In six years, the program has become the largest degree-granting science policy program in the United States. Admissions information is contained in the SPIA section of this *Bulletin*.

3. *The Behavioral Studies Group*—This part of the Program focuses on the social and behavioral factors associated with technological development. It is a multidisciplinary group with expertise in motivational and behavioral aspects of technology assessment in the areas of transportation, energy use, communications, energy conservation, new town program development, public health (family planning, community mental health), and education. Work includes applications of TA to program development and evaluation, as well as to dissemination and utilization of strategies to improve the constructive uses of technologies in these areas.

The Program of Policy Studies normally has between 15 and 20 professionals and many students working on several projects, most of which are problem-oriented and interdisciplinary in nature. Members of the faculty, graduate students, members of governmental agencies, and special consultants are regularly involved in our studies. To date the Program has performed over 75 policy studies and has published over 100 reports, monographs, books, and special papers which have been distributed to professionals and institutions throughout the world. Funding for the Program's activities has come from a variety of sources: the University; federal agencies, including DOT, EPA, ERDA, HEW, HUD, NASA, Commerce, OTA, and NSF; and private foundations, including The Ford Foundation.

Professional Associates

Director **Louis H. Mayo**, *Vice President for Policy Studies and Special Projects; Professor of Law*
Associate Director **Vary T. Coates**, *Senior Staff Scientist and Director, Technology Assessment Group (Political Science)*
Robert W. Anthony, *Senior Staff Scientist (Physics, Systems Modeling)*
Guy Black, *Professor of Business Economics*
James M. Brown, *Senior Staff Scientist; Professor of Law*
Richard Ericson, *Senior Staff Scientist; Professor of Management*
Henry B. Freedman, *Research Associate*
James U. Hamersley, *Research Associate (Law)*
Henry H. Hitchcock, *Research Associate (International Relations)*
Charles V. Kidd, *Senior Staff Scientist (Public Affairs)*
Lee M. Loegdon, *Research Scientist; Director, Graduate Program in Science, Technology, and Public Policy; Associate Professor of Public Affairs and Political Science*

Joseph B. Margolin, *Senior Staff Scientist; Director, Behavioral Studies Group*
Milton C. Marney, *Consultant (Normative Systems Research)*
Marion R. Misch, *Research Scientist; Deputy Director, Behavioral Studies Group*
Henry R. Nau, *Graduate Program in Science, Technology, and Public Policy; Associate Professor of Political Science and International Affairs*
Herman Pollack, *Research Professor of International Affairs (Political Science)*
Edward Studholme, *Manager, Airport Noise Reduction Policy and Planning Study*
Albert H. Teich, *Deputy Director; Associate Professor of Public Affairs*
Ernest Weiss, *Senior Staff Scientist (Transportation Programs Specialist)*

NATIONAL HEALTH POLICY FORUM

Judith K. Miller, *Director*
Marion Ein, *Associate Director*

The National Health Policy Forum assists professional staff members employed by the executive and legislative branches of the federal government in the health field to obtain a more realistic understanding of actual health practices and problems, and to improve communications between Washington-based professional staff members and experts in the field. Exposure to problems and issues facing the entire country is gained primarily through sequenced evening discussions or workshops and, where appropriate, site visits to various localities. Although attendance is primarily limited to Congressional aides and top-level health staff from the many government agencies involved in health, GWU students and faculty can be accommodated on a space-available basis.

INSTITUTE FOR EDUCATIONAL LEADERSHIP

Samuel Halperin, *Director*
Elizabeth Johns, *Associate Director for Management*
Paul Schindler, *Director, Education Policy Fellowship Program*
Elizabeth Hale, *Associate Director*
Emerson Elliott, *Acting Director, Educational Staff Seminar*
Philip Kearney, *Coordinator and IEL Associate Director for State Programs, The Associates Program*
John Merrow, *Producer, "Options in Education"*
A. Sidney Johnson III, *Director, Family Impact Seminar*
Theodora Ooms, *Deputy Director*
Ruth Hubbell, *Associate Director for Research*
George Kaplan *Coordinator, Washington Policy Seminar*
Diane Brundage, *Coordinator, Ford Fellows in Educational Journalism*
Lisa Walker, *Coordinator, Education of the Handicapped Policy Project*
Diane Brundage, *Communications Coordinator*
Richard Sepic, *Program Associate*
Catherine Arnold, *Budget Officer*
Dietra Norris, *Chief Administrative Officer*

The Institute for Educational Leadership (IEL) seeks to strengthen present and potential leadership in American education at the policy levels of state and federal government. Established in 1971, IEL is a policy planning and coordinating agency for a number of related educational programs, including Education Policy Fellowship Program, Educational Staff Seminar, The Associates Program, "Options in Education" over National Public Radio, Washington Policy Seminar, Family Impact Seminar, and Ford Fellows in Educational Journalism. IEL is supported by a major grant from The Ford Foundation and by various grants from foundations and federal agencies.

The objectives of the Institute are carried out under the following programs and activities:

1. *Education Policy Fellowship Program* (formerly Washington Internships in Education) is a national program designed to help provide future educational leaders with skills in policymaking for effective and enlightened leadership. Funds for the program are provided by the Ford, Rockefeller, and Cleveland Foundations. Since 1964, the program has placed over 550 mid-career persons in one-year internships in public and private agencies involved in educational policy matters.

2. *Educational Staff Seminar* is a professional development program designed for staff members employed by the executive and legislative branches of the federal government in the field of education. It is designed to expose these federal education policymakers to existing programs throughout the nation, and to innovations, research, and emerging ideas in the field.

3. *The Associates Program* is an evolving IEL activity. Its emphasis up to now has been to provide seminars for legislators and other policymakers at state capitals. Begun in 1972 with three state educational seminars, the Program now sponsors 31 seminars, all directed by Associates who arrange five to ten programs annually.

The Program maintains a network of state-level "generalists" (Associates) whose ties to IEL in the nation's capital provide rare linkages among federal and state education policy-setters. It also sponsors national and regional conferences dealing with state-level responsibilities in education.

4. *"Options in Education,"* co-produced by IEL and National Public Radio, is a weekly series heard over most of NPR's 190 member stations from coast to coast. Voice of America rebroadcasts the one-hour programs, and IEL makes cassettes and transcripts available at minimum cost. "Options" has received awards from the National Association of State Department of Education Information Officers (1977), the Education Writers Association (1975 and 1976), and the Council for Advancement and Support of Education (1974). A list of NPR member stations and a catalog of available cassettes and transcripts are available from IEL.

5. *Family Impact Seminar* seeks to identify and assess the effect on families and children of a variety of public policies. The Seminar and its several task forces are composed of scholars and policymakers. Together, they examine and test the feasibility of developing "family impact statements" on selected government policies and programs. The specific issues to be examined are selected from a broad range of existing or proposed public policies.

6. *Ford Fellows in Educational Journalism* is an intensive, short-term

professional development program for educational reporters and journalists. This pioneering effort has offered 29 Fellows a "sabbatical" from the fast-paced immediacy of daily educational reporting and allows them to pursue a full-time, three-month course of independent study in their designated area of educational interest. The program reflects the conviction that better-informed media will be a direct and positive influence for better education.

7. *The Washington Policy Seminar* brings groups of state educators and policymakers to the Capital for three days of intensive exposure to the processes, people, and institutions which shape federal education policy. Speakers for the Seminar include members of Congress, Congressional staff, senior officials of the Executive branch, leaders of education associations, and seasoned "Washington watchers."

Further information on these programs is available from the Institute for Educational Leadership, 1001 Connecticut Ave., N.W., Washington, D.C. 20036.

SPONSORED RESEARCH

Vice President for Administration and Research C.J. Lange

These special programs were established for the specific purpose of considering, in an academic atmosphere, problems proposed by the individual projects or submitted by the sponsoring agency. Cooperation between these programs and the various departments of instruction is as close as the nature and needs of the programs and departments will permit.

CENTER FOR SOCIAL POLICY STUDIES

Director Sar Levitan

The Center for Social Policy Studies is devoted to the evaluation of federally-supported manpower, antipoverty and related programs. The Center is financed by a grant from the Ford Foundation and offers, in conjunction with the Department of Economics, graduate courses in labor economics and social policy.

EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC) CLEARINGHOUSE ON HIGHER EDUCATION

Director Jonathan Fife

The Educational Resources Information Center (ERIC) Clearinghouse on Higher Education, established in the fall of 1968, is supported by the

National Institute of Education. The Clearinghouse is responsible for the acquisition, evaluation, abstracting, indexing and dissemination of research reports and other documents dealing with problems and issues in higher education, prepares state-of-the art and review papers related to higher education and responds to individual inquires concerned with higher education.

NATIONAL HEALTH POLICY FORUM

See Policy Studies and Special Projects, page 188.

INSTITUTE FOR EDUCATIONAL LEADERSHIP

See Policy Studies and Special Projects, pages 188-90.

INSTITUTE FOR MANAGEMENT SCIENCE AND ENGINEERING

Director W.H. Marlow

The Institute for Management Science and Engineering provides a multi-disciplinary environment for innovative graduate teaching and substantial opportunities for research activities and public service under diversified sources of external support. Through its Program in Logistics, the Institute performs research leading to the development of a science in logistics featuring principles and methodology for resource allocation problems in civil affairs and national defense efforts.

MID-EAST REGIONAL RESOURCE CENTER

Director Raymond Cottrell
Associate Director Nona Flynn

The Mid-East Regional Resource Center is one of a number of centers serving under contract to the Bureau of Education for the Handicapped, U. S. Office of Education. The area served includes Delaware, Maryland, West Virginia, and North Carolina. The primary mission of the project is to assist state education agencies and affiliated agencies within its area to comply with the Individualized Educational Programming requirements of Public Law 94-142.

NATURAL RESOURCES POLICY CENTER

Director Mary Holman

The Natural Resources Policy Center was established in September, 1965, to sponsor faculty and student research in the area of natural resources and environmental quality; to develop and undertake activities that promote undergraduate and graduate education; and to train employees of public

resource agencies. The program of the Center focuses particularly on increasing the contribution of the social sciences to the solution of contemporary problems relating to the management and development of natural resources. The Natural Resources Policy Center, which provides a focus on natural resource and environmental quality problems and issues, is an integral part of the Department of Economics in both the design of its research program and its courses.

PROGRAM OF POLICY STUDIES IN SCIENCE AND TECHNOLOGY

See Policy Studies and Special Projects, pages 186-88.

SOCIAL RESEARCH GROUP

Director Ira Cisin
Associate Director H.J. Parry

The Social Research Group conducts surveys and experiments with concentration on basic research underlying an approach to the solution of social problems.



COURSES OF INSTRUCTION

The following pages contain listings and descriptions of courses offered by the departments of instruction and special interdepartmental programs. The courses as here listed are subject to change. The University reserves the right to withdraw any course announced or to change the course fees shown herein.

HOURS OF INSTRUCTION

Classes are scheduled in the morning, afternoon, and evening. Evening and daytime sections of the same course are identical, are taught by the same staff of instructors and carry the same amount of credit.

EXPLANATION OF COURSE NUMBERS

First-group courses—Courses numbered from 1 to 100 are planned for students in the freshman and sophomore years. With the approval of the advisor and the dean, they may also be taken by juniors and seniors. In certain instances, they may be taken by graduate students to make up undergraduate deficiencies or as prerequisites to advanced courses, but they may not be taken for graduate credit.

Second-group courses—Courses numbered from 101 to 200 are planned for students in the junior and senior years. Except for accounting courses, they may be taken for graduate credit only upon the approval of the Dean and the instructor at the time of registration. Such approval is granted only with the provision that students must complete additional work to receive graduate credit. Accounting courses numbered 101–200 may not be taken for graduate credit.

Third-group courses—Courses numbered from 201 to 300 in the Graduate School of Arts and Sciences and the School of Government and Business Administration, and courses numbered 201 to 400 in the School of Education and Human Development, are planned primarily for graduate students. They are open, with the approval of the instructor, to qualified seniors; they are not open to other undergraduates. Qualified seniors in the School of Government and Business Administration registering for these courses must have a 3.00 average, the prior approval of the department chairman who is responsible for the graduate course, and the prior approval of the dean. Non-degree students who have not completed a bachelor's degree may not enroll in graduate courses offered by the School of Government and Business Administration.

Fourth-group courses—Courses numbered 301 to 400 in the Graduate School of Arts and Sciences are limited to graduate students, but they are primarily for doctoral candidates. Courses numbered 301 to 400 in the School of Government and Business Administration are limited to doctoral students. In the School of Education and Human Development fourth-group courses, numbered 401 to 500, are limited to graduate students with master's degrees from accredited institutions.

Fifth-group courses—Courses numbered 701 and 721 explore topics not normally included in departmental offerings and utilize insights and methods from disciplines in addition to those usually identified with the sponsoring department. The 701 number is used to designate courses taught by an individual faculty member; the 721 number is used to designate upper-level courses in which faculty from two or more departments investigate a topic of mutual academic interest.

KEY TO ABBREVIATIONS

The following abbreviations are used by the University for course designations.

Acct	Accounting
AmCv	American Civilization
Anat	Anatomy
Anes	Anesthesiology
Anth	Anthropology
ApSc	Applied Science
Art	Art
ArTh	Art Therapy
Bioc	Biochemistry
BiSc	Biological Sciences
BAd	Business Administration
Cart	Cartography
Chem	Chemistry
CH&D	Child Health and Development
Chin	Chinese
CE	Civil Engineering
Clas	Classics
ClEn	Clinical Engineering
CSci	Computer Science
Derm	Dermatology
Econ	Economics
Educ	Education
EPol	Education Policy
EE	Electrical Engineering
EAd	Engineering Administration
EngS	Engineering Science
Engl	English
EFL	English as a Foreign Language
EnHe	Environmental Health
Envr	Environmental Studies
Hum	Experimental Humanities
ForS	Forensic Sciences
Fren	French
Gnet	Genetics
Geod	Geodesy
Geog	Geography and Regional Science
Geol	Geology
Geop	Geophysics
Ger	Germanic Languages and Literatures
Gern	Gerontology
HCA	Health Care Administration
HCS	Health Care Sciences
Hist	History
HKLS	Human Kinetics and Leisure Studies
Idis	Interdisciplinary Courses
IAf	International Affairs
Ital	Italian
Japn	Japanese
Jour	Journalism
Law	Law
LEnf	Law Enforcement
Mgt	Management Science
Math	Mathematics
ME	Mechanical Engineering
M&PA	Medical and Public Affairs
Med	Medicine
Micr	Microbiology
MStd	Museum Studies
Mus	Music
NSur	Neurological Surgery
Neur	Neurology
Ob&G	Obstetrics and Gynecology
Ocea	Oceanography
OR	Operations Research
Opht	Ophthalmology
Oral	Oral Biology
Orth	Orthopaedic Surgery
Otol	Otolaryngology
Path	Pathology
Phar	Pharmacology
Phil	Philosophy
Phys	Physics
Phyl	Physiology
PSc	Political Science
Port	Portuguese
Pchi	Psychiatry and Behavioral Sciences
Psyc	Psychology
PAd	Public Administration
Rad	Radiology
Rel	Religion
SLP	Service Learning Program
Slav	Slavic Languages and Literatures

Soc	Sociology	**TCom**	Telecommunication Operations
Span	Spanish	**U&RP**	Urban and Regional Planning
SpEd	Special Education	**Urol**	Urology
SpDr	Speech and Drama	**WStu**	Women's Studies
Stat	Statistics		
Surg	Surgery		

SEMESTER HOURS OF CREDIT

The number of semester hours of credit given for the satisfactory completion of a course is, in most cases, indicated in parentheses after the title of the course. Thus, a year course giving three semester hours of credit each semester is marked (3–3), and a semester course giving three semester hours of credit is marked (3). A semester hour may be defined as one 50-minute period of class work or one laboratory period a week for one semester.

TIME OF COURSE OFFERINGS

Following most course descriptions is a parenthetical statement listing the semester (fall or spring) for which the course is scheduled. The term "academic year" is used only with two-semester courses, and indicates that the first half of the course is to be offered in the fall semester and the second half in the spring semester. Not all offerings for the summer sessions are listed in this *Bulletin*. Students should consult the Summer Sessions *Schedule of Classes* for additional summer offerings. A *Schedule of Classes* is published each fall and spring semester to provide information concerning the time of course offerings.

ACCOUNTING

Professors E.J.B. Lewis, A.J. Mastro (Chairman), F.C. Kurtz, C.M. Park
Professorial Lecturer J. Tillmy
Associate Professor M.G. Gallagher
Associate Professorial Lecturers T.W. Segal, E.J. Shuchart
Assistant Professors G. Bodnar, P. Wellens
Assistant Professorial Lecturer F. McReady
Adjunct Instructors G.E. Farrelly, D.R. Sheldon, A.C. Riley

Bachelor of Business Administration in the field of accounting. See pages 35–42

Master of Accounting—Prerequisite: A bachelor's degree in accounting or business administration from an institution accredited by the American Assembly of Collegiate Schools of Business; a bachelor's degree in another field plus prerequisites; in either case the following courses or course equivalents must be completed: Acct 1, 2, 101, 151, 161, 171, 181, BAd 211, 161, MSI 110, Stat 1. These prerequisites may be fulfilled by waiver for prior work completed or by completing the courses in the first half of the Master of Accounting program. Required: the generic requirements, pages 146–47, and 30 semester hours of graduate course work, including Acct 201, 271, 281, 351, 361, 364, 371, 381, Mgt 141, and a comprehensive examination in the final semester of course work in the following semester. A maximum of six graduate hours may be approved for transfer into the program.

Master of Business Administration with a concentration in accounting—Prerequisite: A bachelor's degree, see pages 145–46. Required: the general requirements, pages 146–53, common body of knowledge courses or course equivalents: Acct 201, BAd 201, 230, 240, 297; Econ 271, 216; Mgt 200, 202, 218. General instruction in administration courses: BAd 202, 211, 257; Mgt 204; and six semester hours of electives, selected with the approval of the advisor from courses outside the field of concentration of accounting, with only three credits from any one field. Concentration courses: Acct 220, 262, 276, 277 and a comprehensive examination in the final semester of course work or the following semester. (Note: BAd 297 cannot be waived in the common body of knowledge course area by a prior similar course.)

Doctor of Business Administration and Doctor of Public Administration, see pages 156–59. Students admitted to the doctoral program with accounting as the major field may be considered for concurrent appointments as Adjunct Instructors. Criteria for selection include a Master's degree and a C.P.A. Courses to be taught are restricted to Acct 1 and 2. See Chairman of the Accounting Department for details.

Accounting courses numbered below the 200 level may not be taken for graduate credit. Accounting courses numbered 200 and above may not be taken for undergraduate credit.

First Group

1–2 **Introductory Accounting** (3–3) Gallagher, Kurtz

Basic understanding of accounting concepts, procedures, analyses and reports; the accounting measurement and communications of significant economic and financial data. There is a $25 laboratory fee for Acct 1. Prerequisite: sophomore status. Acct 1 is prerequisite to Acct 2. Students who have received credit for a similar financial accounting course cannot receive credit for Acct 1. (Acct 1 and 2 fall and spring)

Second Group

101 **Cost and Budgetary Control** (3) Bodnar

Cost behavior and volume-profit relationships, responsibility accounting, standard costs, flexible budgets, cost structures for control and motivation, relevant costs, cost concepts. Prerequisite: Acct 1–2 and junior status. Students who have received credit for Acct 193 cannot receive credit for Acct 101. (Fall and spring)

111 **Financial Statement Analysis** (3) Hilmy

Analysis and interpretation of financial statements for the guidance of management, directors, stockholders, and creditors. Prerequisite: Acct 1–2. (Spring)

121 **Intermediate Accounting** (3) Mastro

In-depth study of accounting functions and basic theory: acquisition of assets and services, income and equity accounting, preparation and analysis of financial statements. Prerequisite: Acct 1–2 and junior status. Laboratory fee, $25. (Fall)

132 **Accounting Theory** (3) Mastro

Current thought as reflected in the pronouncements of leading professional and accounting research associations, major contributions

to accounting literature. Prerequisite: Acct 121 and senior status. (Spring)

141 Governmental Accounting (3) Lewis

Appropriation, encumbrance, and fund accounting for governmental and institutional entities. Prerequisite: Acct 1–2. (Fall)

161 Federal Income Taxation (3) Gallagher

Federal income tax concepts applicable to individuals and corporations, differences between tax accounting and financial accounting. (Fall and spring)

171 Auditing (3) Kurtz

Principles and procedures of auditing: generally accepted auditing standards, internal control, audit objectives and reports, form-preparation use of audit work papers, audit evidence. Prerequisite: Acct 121 and senior status. (Fall)

181 Accounting Systems (3) Bodnar

Data processing considerations in the design and operation of accounting systems. Principles of internal control applicable to manual and automated accounting systems. Prerequisite: Acct 101, 171, and senior status. (Spring)

191 Advanced Accounting (3) Gallagher

Application of accounting theory to special areas: consolidated statements, business combinations, earnings per share, foreign exchange, price-level adjusted statements, source and application of funds. Prerequisite: Acct 121, and junior status. (Spring)

193 Business Budgeting (3) Lewis

Principles and procedures in the development, installation, and operation of a system of budgetary control to aid management. Prerequisite: Acct 1–2. Students who have received credit for Acct 101 cannot receive credit for Acct 193. (Fall and spring)

199 Accounting Practice Internship (3) Mastro

Concepts, procedures and standards of auditing practice obtained as an intern with a firm or agency. Prerequisite: 15 semester hours of accounting courses (including a course in auditing), senior status, and approval of the chairman of the department.

Third Group

201 Financial Accounting (3) Kurtz

For designated students in the M.B.A. program. The role of accounting in the decision-making process of external parties—the understanding, interpretation, and implementation of financial accounting. (Course equivalent: a similar graduate financial accounting course, or Acct 1 and 2, or two similar undergraduate courses.) (Fall and spring)

211 Business Law For Accountants (3) Gallagher

A study of the legal process and of the principles and precepts of business law: contracts, property, sales, partnerships, and corporations. Prerequisite: Master of Accounting status. (Fall)

220 Management Accounting (3) Paik

The role of accounting in the decision-making processes of management: understanding of how accounting influences resource allocation

decisions in the organization. Prerequisite: Acct 201. (Fall and spring)

221 Cost Analysis (3) Bodnar

An advanced cost accounting course with emphasis on comparative costs and cost accounting standards. Prerequisite: Master of Accounting status. (Spring)

232 Generally Accepted Accounting Standards (3) Mastre

A critical understanding of the Financial Accounting Standards Board Pronouncements Standards and the Security and Exchange Commission Accounting Series Releases. Prerequisite: Master of Accounting status. (Spring)

251 Accounting For Multinational Corporations (3) Segel

A study of international accounting standards with emphasis on accounting for foreign currency requirements compatible with domestic accounting consolidation standards. Prerequisite: Acct 201 and 220. (Spring)

261 Federal Income Taxation of Individuals (3) Gallagher

A study of federal income taxation of individuals covering gross income, deductions and credits, sales, other dispositions of property, capital gains and losses, and timing. Prerequisite: Master of Accounting status. (Fall)

262 Business Income Taxation (3) Gallagher

Federal income tax concepts applicable to corporations, partnerships and their owners; emphasis on tax planning factors in business decisions and tax research. (Fall)

263 Federal Income Taxation of Corporations (3) Gallagher

A study of federal income taxation of corporations, covering capital structure, distributions out of and in liquidation, and corporate reorganizations. Prerequisite: Master of Accounting status and Acct 261. (Spring)

264 Federal Taxation of Estates, Gifts, and Trusts (3) Gallagher

A study of estates, gifts, and trusts covering gross estates, state transfer taxes, valuation problems, planning estate liquidity, complex trusts. Prerequisite: Master of Accounting status and Acct 261. (Spring)

275 Contemporary Auditing Theory and Procedures (3) Kurtz

Study of auditing concepts, generally accepted auditing standards, application of statistical sampling to auditing, audit of electronic data processing systems. Prerequisite: Master of Accounting status. (Spring)

276 Management Planning and Control (3) Paik

Integrative case study approach to management systems for planning, control, and decisions. Value indices for organizational subsystems, transfer pricing, contemporary control systems, accounting frameworks and cycle. Prerequisite: Acct 201 and 220. (Spring)

277 Accounting and Decision Systems (3) Paik

Accounting as a basis for economic decision making by management and investors. Prerequisite: Acct 201 and 220. (Fall)

282 **Accounting Information Systems** (3) Bodnar
Development and application of accounting system theory, including analysis, design, and implementation. Integration of automatic data processing, accounting systems, and management information systems. Prerequisite: Acct 201 and 220. (Fall)

290 **Special Topics in Accounting** (3) Staff
Experimental offering; new course topics and teaching methods. May be repeated once for credit. (Fall or spring)

298 **Directed Readings and Research in Accounting** (3) Mastro and Staff

299 **Thesis Seminar** (3) Mastro and Staff
(Fall and spring)

300 **Thesis Research** (3) Mastro and Staff
(Fall and spring)

Fourth Group

Fourth-group courses are primarily for doctoral students and are offered as the demand requires. The courses are open to other graduate students at the discretion of the department.

311–12 **Seminar: Public-Private Sector Institutions and Relationships** (3–3)
An analysis and critique of alternative theoretical frameworks for describing, understanding, and predicting the nature, values, and actions of American public and private institutions. Problems, potentials, and alternatives for structuring public and private institutional arrangements to meet the needs of society.

398 **Advanced Reading and Research** (arr.) Mastro and Staff
Limited to students preparing for the Doctor of Business Administration or Doctor of Public Administration general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Mastro and Staff
Limited to Doctor of Business Administration or Doctor of Public Administration candidates. May be repeated for credit. (Fall and spring)

AMERICAN LITERATURE

See **English.**

AMERICAN STUDIES PROGRAM

Professors R.H. Walker, Jr., C.C. Mondale
Professorial Lecturer L. Miller
Associate Professors B.M. Mergen, J.O. Horton, H.F. Gillette, Jr. (*Director*)
Assistant Associate Professors C.R. Field, J.N. Pearce
Associate Professorial Lecturers J. Mahoney, Jr., D.A. O'Toole, T.A. Comp

Adjunct Assistant Professor P.M. Palmer
Assistant Professorial Lecturers B.G. Carson, L.D. Lankton, H.W. Marshall, J.F. Santino, S.J. Zeitlin, P.J. Cressey, J. Haas

Affiliated Programs

John Y. Cole (Library of Congress)
Atlee Schidler (Washington Center for Metropolitan Studies)
Wilcomb E. Washburn (Smithsonian Institution)

Faculty Advisory Committee

H.F. Gallette (*Chairman*), S. Carroll, R.S. French, F.S. Grubar, R.L. Humphrey, H.L. LeBlanc, O. Scarvey, R.P. Sharkey, R.W. Stephens, A.M. Yezer, D. Wallace, Jr.

American Studies Council

The Council serves the American Studies Program in an advisory capacity. It includes representatives from the student body, the Washington community, the faculty, alumni, and affiliated programs.

Bachelor of Arts with a major in American Civilization (field-of-study). The following requirements must be fulfilled:

1. The general requirements stated on pages 73-75, 79-85.

2. Prerequisite course—AmCv 271-272. (In preparation for the major field it is recommended that students take the introductory American history course and elect introductory courses in anthropology, art, economics, English, geography and regional science, philosophy, political science, religion and sociology.)

3. Required courses in the major—(a) 15 semester hours of approved second-group courses in the humanities (history may be elected for (a) or (b), but not for both); (b) 15 semester hours of approved second-group courses in social sciences; (c) AmCv 299-300, which must be taken in the senior year.

The major examination required of all seniors must be satisfactorily completed in the final year.

Special Honors will be awarded to students who fulfill the general requirements (see page 30) and in addition (1) receive grades of A in at least half of their courses in the two areas of concentration and (2) receive honors in the major examination.

Two years of a foreign language or adequate preparation in statistics, logic, or linguistics is strongly recommended. Students should consult frequently with an American Civilization advisor.

Master of Arts in the field of American Civilization. Prerequisite: the degree of Bachelor of Arts with an undergraduate major in American Civilization or in the subject in which concentration is contemplated.

Required: the general requirements, pages 86-88, including (1) AmCv 271-272 (six semester hours), a seminar on scope and method in American Civilization; (2) 18 additional semester hours in a carefully related pattern, focusing on a concentrated approach to the study of American Civilization; (3) a master's thesis (six semester hours) written on an approved topic under the direction of the instructor in whose field the major emphasis falls; (4) a Master's Comprehensive Examination reflecting the candidate's area of concentration. Special options in the degree program include the following:

1. *A concentration in Museum Training*—Course emphasis on substantive research in material culture under direction of staff at the Smithsonian Institution. Required: in addition to the general requirements outlined above, AmCv 250. Recommended, but not required: AmCv 252, 351 or 352 (advanced research), AmCv 251 (internship) and other related courses offered by the departments of anthropology, art, or education

2. *A concentration in Historic Preservation*—Course emphasis on interpreting issues in historic preservation through a humanistic framework. Prerequisite: background in urban history. Required: in addition to the general requirements outlined above, AmCv 277–78. Recommended, but not required: additional courses in architectural history, urban and regional planning, and local history.

Master of Arts in the field of Museum Studies, see pages 381–83

Doctor of Philosophy in the field of American Civilization—This program combines work in the humanities and/or social sciences as preparation for research and teaching, with the option of stressing preparation for museum and library careers. Applicants are required to have an adequate background in the humanities and/or social sciences as they apply to the understanding of American civilization.

Required: the general requirements, pages 80–81, 87–90. Candidates must pass a General Examination in four areas. American cultural history is the only required field. Three other fields may be elected with approval of the advisory committee; one field must represent foreign coverage. Other areas may be chosen from the following groups: (1) American diplomatic, economic, political, social or urban history; American literature, art, philosophy or religion; Afro-American history; historic preservation; or some areas of the social and behavioral sciences; (2) in affiliation with the Library of Congress—supervised historical study in bibliographic resources including American history and politics, cartography, cross-cultural studies, government documents, graphic arts and music, motion pictures and recorded sound, printing and bookmaking; (3) in affiliation with the Smithsonian Institution (Museum of History and Technology, National Portrait Gallery and National Collection of Fine Arts)—supervised studies including architectural history, decorative arts, ethnohistory, historical archaeology, history of science, history of technology, industrial archeology, material culture of American civilization, and various fields in the history of art. Additional areas of study may be arranged within the University and in both the Library of Congress and Smithsonian cooperative programs. Special announcements concerning these programs are issued periodically and are available in the Office of the Director of the American Studies Program.

Research fields for the dissertation may be chosen from any of the above except those dealing with the culture of an area outside the United States.

First Group

71–72 **Introduction to American Civilization** (3-3) Gillette, Morgan

Themes and issues in American civilization since Colonial times with emphasis on their contemporary importance. (Academic year)

Second Group

160-61-62 **Studies in American Literature** (3–3–3) Scavey, Combs, Sten

Same as Engl 160-61-62. Major factors in the national cultural tradition as shown by outstanding writers. (AmCv 160, 162—fall; 161—spring)

165 **Introduction to Folklore** (3) Santino, Zeitlin

History of folklore studies in Europe and America, terminology and study of different folk genres. Same as Anth 165

173 Afro-American History (3) Horton

Survey of the Afro-American experience emphasizing the contributions of black Americans to, and their impact upon, American history. Same as Hist 173. (Fall)

174 Special Topics in Afro-American History (3) Horton

Concentration on specific issues central to the Afro-American experience. Consult Spring Schedule of Classes for issues to be addressed. Same as Hist 174. (Spring)

177 Introduction to Historic Preservation (3) Pearce

Washington, D.C. will be the primary exhibit for the study of historic preservation as it has developed over the past century. Experience with preservation issues as shown by examples in other localities will also be discussed. Lectures, class discussions of the readings, and field trips to neighborhoods and sites subjected to preservation efforts. (Summer)

179–80 Proseminar in American Civilization (3–3) Mondale

Coordinating course for seniors majoring in American Civilization. (Academic year)

***185 History of Women in America** (3) Staff

Survey of the political, economic, social, military, religious, intellectual, and cultural practices in North America from 1000 A.D. to the present as these have affected and been affected by the female half of the population. (Fall)

***186 U.S. Urban History** (3) Gillette

History of the American city from colonial foundations to the present, focusing on relationships between social and economic forces with physical form. Special emphasis on transitions from pre-industrial to industrial to metropolitan forms, with attention to implications for public policy and historic preservation. (Fall)

†**192 The American Cinema** (3) Kernan

History and criticism of American films. The course will enable the student to recognize and evaluate cinema techniques, to express the evaluation clearly in writing, and to understand the role of films in the context of American culture. (Spring)

195 Independent Study (3) Staff

Open to a limited number of American Civilization majors as directed research or as an internship with a Washington museum or historical society. Approval of advisor required. (Fall and spring)

***197 Oral History and Interview Techniques** (3) Gillette

Introduction to theory and practice of obtaining and using historical data through recorded interviews. Examination of major published works in oral history. Particular attention to ongoing oral history projects in the Washington area. (Spring)

Third Group

225 History of Washington, D.C. (3) Gillette

The social history of Washington, from village to metropolis, with emphasis through field trips on the evolution of residential neigh-

* Joint offering of the American Studies Program and the History Department.
† Joint offering of the American Studies Program and the Speech and Drama Department.

borhoods and related issues of historic preservation and conservation. Same as Hist 280. (Summer)

*260 **Women in the American Work Force** (3) Palmer

Multidisciplinary historical survey of women's work roles and labor force participation, including general prescriptions for and self-perceptions of women; market and technological factors affecting women's work choices; psychological responses to work roles; and familial organization of work duties. Differential attitudes and experiences by class, race, and ethnic groups. (Fall)

271–72 **Seminar: Scope and Methods in American Studies** (3–3) Mondale

Consideration of American studies as an area for research and teaching; introduction to bibliography. Required of candidates for the degree of Master of Arts in the field of American Civilization. (Academic year)

†274 **Research Seminar: Materials in Afro-American Culture** (3–3) Horton

Prerequisite: AmCv/Hist 173–74 or equivalent. (Spring)

§276 **U. S. Architectural History** (3) Pearce

Basic stylistic developments in American architecture from the 17th through the 20th centuries with special emphasis on the applicability of style recognition to buildings and neighborhoods in urban America. Architecture as evidence of American cultural history and guide to historic preservation. (Fall)

§277–78 **Historic Preservation** (3–3) Pearce

The preservation movement and its literature. Review of current experience, preservation practice and techniques. Emerging aspects of historic preservation. Examples of historic, cultural, and humanistic values affecting preservation activities. (Academic year)

280 **Seminar: Urban History** (3) Gillette

(Spring)

289–90 **Seminar: Topics in American Civilization** (3–3) Staff

Research problems selected by the instructor. Preparation in American cultural history or other area appropriate to the topic of the seminar. (Academic year)

295 **Independent Study** (arr.) Staff

Limited to master's candidates. Permission of instructor in writing, required. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff

(Fall and spring)

Fourth Group

379–80 **Readings in American Cultural History** (3–3) Morgan

For students preparing for the Doctor of Philosophy general examination in the field of American Civilization. (Academic year)

[illegible]

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

COURSES OFFERED IN AFFILIATION WITH THE LIBRARY OF CONGRESS

The Graduate School of Arts and Sciences is affiliated with the Library of Congress in a program leading to the degree of Doctor of Philosophy. The following courses are offered at the Library of Congress by members of its staff.

Third Group

255–56 **Research Orientation Seminar: Americana in the Library of Congress** (3–3) Cole, Walker
Examination of the collections of the Library of Congress with the aim of increasing understanding of American culture and awareness of library-oriented research problems and possibilities. For students in the affiliated doctoral program, this course may lead directly to a field in "Research Materials for the Study of American Life: Their Content, Collection, Arrangement, and Use." (Academic year 1979–80 and alternate years)

Fourth Group

355–56 **Practicum: Advanced Library Research** (3–3)
Practical problems in control of library materials with emphasis on collections in the Library of Congress. A reading field in the affiliated program. Prerequisite: AmCv 255–56. (Academic year)

389 **Advanced Reading and Research** (arr.)
Limited to students preparing for the Doctor of Philosophy general examination in fields offered in affiliation with the Library of Congress. May be repeated for credit. (Fall and spring)

390 **Dissertation Research** (arr.)
For Doctor of Philosophy candidates preparing dissertations based upon or significantly related to collections of the Library of Congress. Supervised by specialists at the Library. Prerequisite: AmCv 355–56. (Fall and spring)

COURSES OFFERED IN AFFILIATION WITH THE SMITHSONIAN INSTITUTION

The Graduate School of Arts and Sciences is affiliated with the Smithsonian Institution's Program for Graduate Students in the History of American Civilization. The following courses are offered at the Museum of History and Technology and at the National Portrait Gallery by members of their staffs.

Third Group

250 **Orientation Course: Material Aspects of American Civilization** (3) Washburn, Mergen

Familiarization with the historical collections of the Smithsonian Institution and introduction to opportunities for research and publication based on historical objects. Required of all students in the master's and doctoral programs affiliated with the Smithsonian Institution. (Fall)

251 **Museum Research and Education** (3) Washburn and Staff

Supervised work and/or study under the direction of Smithsonian staff members and research associates—museum visitor behavior, costumes and furnishings, decorative arts and photography as historical documentation. (Fall and spring)

252–53 **American Decorative Arts** (3–3) Carson

(AmCv 252 formerly Museum Research and Education)

Concepts of visual recognition and evaluation of surviving domestic artifacts from the 17th, 18th, and 19th centuries, including those made of wood, clay, glass, metal and cloth. AmCv 252 is prerequisite to AmCv 253. (Academic year)

*254 **Seminar: Folklore in America** (3) Staff

Various aspects of American traditional culture, including the theory and methodology of folklore research.

*270 **Seminar: Museum Exhibiting** (3) Mahoney

Selected museum exhibiting problems in the social and natural sciences, including methods and techniques of exhibition problems of museum communication and education. (Fall)

†284 **Seminar: Studies in American Art and History** (3) Miller

Exploration of selected problems and themes in American cultural history involving the use of artistic materials in different media; emphasis on methodology and analytic techniques. May be repeated for credit. (Fall and spring)

286 **Readings in the History of Technology in America** (3) Comp

Seminar focusing on the major outlines of technological innovation in the United States. Beginning with Colonial and early Federal period technology transfer and adaptation, the course emphasizes the major sectors of 19th- and early 20th-century industrial and engineering development. (Fall)

287 **Introduction to Industrial Archeology and Material Culture** (3) Lankton

Intensive study of tools, machines, and industrial architecture, focusing on the kinds of data they supply the historian. Students will be assigned objects to research. (Spring)

*294 **Field Research in Historical Archeology** (3)

Field techniques, including excavation, recording, photography, preservation, laboratory analysis and interpretation.

---

* Joint offering of the American Studies Program and the Anthropology Department
† Joint offering of the American Studies Program and the Art Department

Fourth Group

351–52 **Research in Selected Aspects of American Civilization** (3–3)
Supervised study and/or field work in selected subject areas related to the activities of the Smithsonian Institution. (Fall or spring)

394 **Advanced Reading and Research** (arr.)
Limited to students preparing for the Doctor of Philosophy general examination in fields offered in affiliation with the Smithsonian Institution. May be repeated for credit. (Fall and spring)

395 **Dissertation Research** (arr.)
For Doctor of Philosophy candidates preparing dissertations significantly related to the material aspects of American civilization. Students work under research supervision at the Smithsonian Institution. Prerequisite: Anth 394. May be repeated for credit. (Fall and spring)

ANATOMY—DOCTORAL PROGRAM

Professors F.D. Allan, T.N. Johnson, R.S. Snell (*Chairman*), E.N. Albert, M.J. Koering
Associate Professor K.E. Johnson
Assistant Professor J. Kerns

Doctor of Philosophy in the Field of Anatomy Required: The general requirements (page 34-0), other conditions must also be met, and proficiency by demonstrating proficiency in two of the following: a language (German, French, Russian, Mandarin), computer science, or biological mathematics. There will also be a comprehensive written and oral examination that will cover at least three areas of anatomical science.

Research fields: cell ultrastructure, embryology, gross anatomy, histology, neuroanatomy, and physical anthropology.

Third Group

202 **Gross Anatomy** (6) — Snell and Staff
Regional dissections of adult cadaver supplemented with lectures and x-rays. Laboratory fee, $30. (Fall)

203 **Human Embryology** (1) — Allan
Origin and development of human body; emphasis on value of embryology in interpreting anatomical anomalies. (Fall)

204 **Neuroanatomy** (2) — T. Johnson
Gross and microscopic anatomy of central nervous system and special senses. Laboratory fee, $13. (Fall)

205 **Human Microscopic Anatomy** (3) — Albert and Staff
Microscopic structure of cells, tissues, and organs of the human body. Laboratory fee, $20. (Fall)

206 **Scanning Electron Microscopy** (2) — Koering
Preparative techniques for various biological tissues; operation of scanning electron microscope, and interpretation of micrographs. Laboratory fee, $30. Enrollment limited. Prerequisite or concurrent registration: Anat 260. (Fall)

208 **Comparative Vertebrate Neurology** (1) T. Johnson
Survey of the evolution of the vertebrate brain. Prerequisite: Anat 204. Laboratory fee, $10. (Spring)

209 **The Use of Audiovisual Techniques in Anatomy** (2) Allan
Preparation of a significant audiovisual program about some aspect of human anatomy. Laboratory fee, $20. (Spring)

212 **Neurobiology (3)** (Same as Phyl 212) Staff
An integrated survey of the structure and function of the human nervous system: lecture, clinical demonstration, and laboratory. Laboratory fee $25.

221–22 **Seminar** (1–1) Gilson*
Research reports and discussions of special topics by guest lecturers, staff, and students. (Academic year)

249 **Introduction to Anatomical Research** (1) Staff
Major research techniques as applied to biological materials in the various anatomical disciplines. (Fall)

252 **Physical Anthropology** (1) Staff
Variations in humans and factors affecting them: human evolution and racial differences; anatomy and culture of ancient humans. (Spring)

254 **Fetal Anatomy** (2) Allan
Dissection of midgestational fetus. Comparison of fetal and adult structures. 20 students. Laboratory fee, $10. (Spring)

256 **Teratology** (1) Gilson*
(Formerly Human Genetics)
Etiology and mechanisms of common congenital malformations. Limited enrollment.

260 **Electron Microscopy in Cellular Biology—Lecture** (1) Koering
Introduction to the morphology of the cell and its relationship to electron microscopic techniques. (Spring)

261 **Transmission Electron Microscopy** (3) Koering
Introduction to the routine processing of specimens; preparation and interpretation of micrographs. Limited enrollment. Admission by permission of instructor. Prerequisite or concurrent registration: Anat 260. Laboratory fee, $25. (Spring)

262 **Gross Anatomy of Upper and Lower Extremities** (2) Snell and Staff
Detailed dissection, supplemented by x-ray anatomy; discussions, assigned reading. Limited enrollment. Laboratory fee, $10. (Spring)

264 **Gross Anatomy of Head and Neck** (2) Snell and Staff
Detailed dissection supplemented by x-ray anatomy; discussions, assigned reading. Limited enrollment. Laboratory fee, $10. (Spring)

266 **Gross Anatomy of Thorax and Abdomen** (2) Snell and Staff
Detailed dissection, supplemented by x-ray anatomy; discussions, assigned reading. Limited enrollment. Laboratory fee, $10. (Spring)

* Ellen Gilson is Assistant Professor of Anatomy in the S.W.U. School of Medicine and Health Sciences.

266 **Gross Anatomy of Pelvis, Perineum, and Lower Extremity** (2) — Snell and Staff
Detailed dissection, supplemented by x-ray anatomy; discussions, assigned reading. Limited enrollment. Laboratory fee, $10. (Spring)

270 **Dissection of the Human Brain** (1) — T. Johnson
Dissection of major pathways and nuclei of the brain with consideration of ventricular system; conferences and assigned reading. Limited enrollment. Laboratory fee, $10. (Spring)

272 **Autonomic Nervous System** (1) — Allan
Developmental, microscopic and gross anatomy, function of central and peripheral components of autonomic nervous system. (Spring)

276 **Advanced Studies in Anatomy** (1) — Staff
Lectures and conferences on selected anatomical subspecialties—endocrinology, teratology, growth, and others. May be repeated for credit. (Spring)

288 **Surface Anatomy and Radiology** (1) — Snell
Lectures and demonstrations on areas of clinical importance. (Spring)

289 **Biochemical and Morphological Techniques in Cell Biology** (3) — Staff
Techniques currently used in the isolation of subcellular fractions and their biochemical and morphological characterization.

295 **Research** (arr.) — Staff
Content differs each time course is offered; may be repeated once for credit. Fee to be arranged. (Fall and spring)

Fourth Group

398 **Advanced Reading and Research** (arr.) — Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) — Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

ANTHROPOLOGY

Professors R.K. Lewis, R.M. Krulfeld, C.M. Turnbull *(Visiting)*, R.L. Humphrey, Jr.
Professorial Lecturer J.L. Angel
Associate Professors V.K. Colla *(Chairman)*, S.L. Simons
Associate Professorial Lecturers J. Mahoney, Jr., G. Stuart, S. Hertz, M. Koch-Weser, E. Jacob, G. Teleki, Jr.
Assistant Professors A.S. Brooks, R.K. Evans *(Visiting)*
Adjunct Assistant Professors C.A. Wagner, C.R. Rose
Adjunct Instructor J. Lanouette
Lecturer R.O. Selig

Bachelor of Arts with a major in anthropology (departmental)—The following requirements must be fulfilled:

1. The general requirements as stated on pages 72–73, 79–85.
2. Prerequisite course—Anth 1–2.
3. Required courses in other areas—(a) 12 semester hours, or equivalent, of introductory French, German, Russian, or Spanish (or another major language approved by the Anthropology Department); (b) six to twelve semester hours of course work in related departments. Recommended for ethnological emphasis are courses in economics, political science, psychology, and sociology; for archeological emphasis, courses in American civilization, art history, geography and regional science, geology, and history; for emphasis in physical anthropology, courses in anatomy and biological sciences. Courses in philosophy and statistics are strongly recommended for all anthropology majors.
4. Requirements for the major—24 to 36 semester hours in second-group anthropology courses, including Anth 101 and at least one course from each of the following four categories: aspects of culture (courses numbered in the 150s), linguistics (161, 168, or 169), ethnology (courses numbered in the 170s), and physical anthropology or archeology (courses numbered in the 180s). Students planning to pursue a graduate degree in anthropology should take Anth 187 and at least one course each in archeology and physical anthropology. Qualified students may enroll in first-level courses with the permission of the instructor. Up to 6 semester hours of ethnographic or archeological field school credit may be accepted and applied toward the major if approved by the department, and students are encouraged to participate in such summer programs. Opportunities for work also exist for field and laboratory research during the academic year both within the department and elsewhere in the Washington area. Credit for such work (not to exceed 6 semester hours) may be granted through registration in Anth 186. Students who wish to be candidates for graduation with Special Honors must register for 3 successive terms of Anth 199 and must graduate with a paper of special distinction arising out of a program of directed reading or research.

Bachelor of Arts with a major in classical archeology and anthropology (departmental)—An interdepartmental major offered by the Anthropology and Art Departments. The following requirements must be fulfilled:

1. The general requirements as stated on pages 72–73, 79–85. (Students should consult a departmental advisor regarding courses to be taken in satisfying the requirement for meaningful initiation into the natural and mathematical sciences.)
2. Prerequisite course—Anth 1–2.
3. Required courses in the major—Anth 152, 158, 177, 184; Art 101, 102, 103, 111; Hist 109, 110. (A reading knowledge of French and German is recommended.)

Master of Arts in the field of anthropology—Prerequisite, a bachelor's degree; a major in anthropology is preferred. The undergraduate program should have included courses above the introductory level in anthropological theory, social organization, linguistics, archeology, and physical anthropology. Students with this background in anthropology may be admitted, but may be required to take one or more undergraduate courses to make up deficiencies before beginning the degree program.

1. General degree—Required: the general requirements, pages 88–96. The minimum requirement consists of 24 semester hours of approved graduate course work, plus a thesis (equivalent to 6 semester hours). A thesis is preferred; under certain circumstances, however, the department may permit a program of study consisting of 36 semester hours of approved course work without a thesis. At least 6 semester hours drawn from the sequence Anth 201, 202, 203, 204 should be included in the program of study and should be completed during the first

24 semester hours of graduate course work. A reading knowledge examination in a major foreign language must be passed before beginning the third semester of graduate work. A tool course in statistics, chemistry, computer programming, or a similar technical field may be substituted for the foreign language reading examination, if approved by the department. A written general Master's Comprehensive Examination must be passed before beginning the 28th semester hour of graduate work.

2. *With a concentration in museum training*—Required: the general requirements, pages 88–96. The program of study is the same as that described for the general degree, above, with the following exceptions: the minimum requirement consists of 36 semester hours of approved graduate course work, and must include from 12 to 15 semester hours of work in museum-related courses, at least 6 semester hours of which must be in an internship. No thesis is required, but students are expected to submit to the department at least one research paper of publishable quality on a museum-related topic. Students whose primary interest is in museum techniques, rather than anthropology are advised to apply to the Master's program in Museum Studies (pages 381–83).

Departmental prerequisite: Anth 1 is prerequisite to Anth 180 through 189; Anth 2 is prerequisite to all other second-group courses. These prerequisites may be waived by permission of instructor.

First Group

1–2 **Introductory Anthropology** (3–3) Staff

Anth 1: survey of human origins, physical evolution, and culture history. Anth 2: survey of the world's cultures, illustrating the principles of cultural behavior. (Anth 1 and 2—fall and spring)

Second Group

101 **Survey of Anthropological Theory** (3) Wagner, Krulfeld, Golde
(Formerly Anth 192, Anthropological Theory)

The development of anthropological thought as seen in historical context. Exploration of selected basic concepts and theories of contemporary anthropology. (Fall)

*115 **Field Methods in Comparative Cultural Ecology: Mesoamerican Archeology** (6) Humphrey, Merger

Field study in Mexico. Intensive analysis of Mesoamerican culture history. (Summer)

150 **Comparative Value Systems** (3) Krulfeld

World views, conceptual systems, and value orientations of representative cultures throughout the world.

151 **Primitive Economics** (3) Krulfeld

Comparative study of various economic organizations, including hunters and gatherers, herders, and cultivators. (Spring, odd years)

152 **Man, Culture, and Environment** (3) Humphrey

Basic principles of cultural ecology. Human interaction with the ecosystem both past and present, emphasis on the application of anthropological precepts to current environmental problems.

*Joint offering of the American Studies Program and the Departments of Anthropology and Geography and Regional Science

153 Psychological Anthropology (3) Jacob

Relevance of psychological theories to human evolution and the cross-cultural study of personality. Cultural determinants of personality formation and mental health. (Fall)

*155 **Anthropological Approaches to Religion** (3) Simons, Wagner
(Formerly Primitive Religion)

Theories of religion developed by anthropologists; survey of world religions with emphasis on preliterate societies; religious processes and change. (Spring)

156 **Comparative Political and Legal Systems** (3) Hertz, Simons

Cross-cultural study of ancient and modern systems of social control: moral, ethical, and legal factors which operate to produce behavioral norms. (Spring)

157 **Primitive Social Organization** (3) Simons, Hertz

Analysis of the social organization of primitive peoples; kinship, economic, and political systems. (Fall)

158 **Art and Culture** (3) Kraulfeld, Humphrey, Wagner

The art of tribal society, including the role of art in culture, influences upon the artist, and beliefs and practices associated with art production.

159 **Cognitive Anthropology** (3) Wagner, Golla

The organization of empirical knowledge in literate and nonliterate societies. Processes of hypothesis, deduction, and classification. (Fall, odd years)

161 **Language and Culture** (3) Golla

Structure and semantics of systems of human communication; linguistic change; social aspects of language. (Fall)

163 **Anthropology of Visual Communication** (3) Staff

Still and motion picture photography as an integral aspect of anthropological research. A study of recent and historic ethnographic films and an introduction to the forms and methods of making visual ethnographic records. Material fee, $15. (Spring)

165 **Introduction to Folklore** (3) Santino, Zeitlin

History of folklore studies in Europe and America; terminology and study of different folk genres. Same as AmCu 165.

168 **Methods of Linguistic Analysis** (3) Golla
(Formerly Anth 162, Linguistics in Anthropology)

Phonetics, grammatical analysis, principles of lexicostatistics, techniques of linguistic reconstruction, and other tools of anthropological linguistic research. (Fall)

169 **Intensive Study of a Language** (3) Golla

Analytic study of a selected language, ordinarily one not frequently studied in a university context, as an illustration of the methods of anthropological linguistics. Prerequisite: Anth 168. (Spring or summer)

* Joint offering of the Anthropology and Religion Departments

170 **Cultures of the Caribbean** (3) Lewis
Culture history and ways of life among the area's various cultural groups up to the ethnographic present. (Spring, even years)

171 **Native Peoples of North America** (3) – Simons, Humphrey
Comparative study of Indian groups representative of each of the continent's culture areas. (Fall)

172 **Cultures of South America** (3) Wagner
Survey of native American, Iberian, and African populations of South America, and their interactions.

173 **Cultures of the Pacific** (3) Lewis
Culture history and ways of life among native peoples of Melanesia, Micronesia, and Polynesia. (Fall, even years)

175 **Topics in Asian and Circumpolar Ethnography** (3) Humphrey, Krulfeld, and Staff
(Formerly Cultures of Southeast Asia)
Intensive, integrated study of a selected culture area in or around Asia (including Circumpolar regions). Specific area to be announced in the *Schedule of Classes*. May be repeated for credit.

177 **Cultures of the Near East** (3) Lewis
Geographic environment, language, religion, and social structure of settled and nomadic peoples of the Near East: emphasis on the Arab world. (Spring, odd years)

178 **Cultures of Africa** (3) Lewis
Comparative examination of the history, cultural development, and contemporary problems of African cultures. (Fall, odd years)

180 **General Archeology** (3) Humphrey, Brooks
Field and laboratory methodology in archeology: stratigraphy, dating techniques, chronological systems and their implications; a brief survey of world prehistory.

182 **New World Archeology** (3) Humphrey
Introduction to archeological methodology, theory, and survey of North American culture history from human entry into the Americas during the Pleistocene period until the time of the first European contacts. (Spring)

183–84 **Old World Prehistory** (3–3) Brooks, Evans
(Anth 184 formerly Ethnohistory)
Survey of human prehistory in Europe, Africa, and Asia from the earliest hominid cultures to the beginnings of advanced civilizations. Anth 183: Paleolithic and Mesolithic cultures. Anth 184: Neolithic and Bronze Age cultures. (Academic year)

185 **Latin American Archeology** (3) Humphrey, Wagner
Culture history of pre-Columbian Latin America from the Paleo-Indian period through the Spanish Conquest. Focus on Andean South America in even years, on Meso-America in odd years. May be repeated for credit. (Spring)

186 **Physical Anthropology of Modern Man** (3) Angel
Individual and social biology, methods, and techniques. Genetic, cultural, and ecologic backgrounds of individual and population variation.

tion: micro-evolution, growth, paleodemography, paleopathology, forensic identification, techniques. (Spring)

187 **Introduction to Hominid Evolution** (3) Brooks
The fossil record of hominid evolution considered in the light of evolutionary theory. Brief review of the earlier human antecedents, with concentration on the Pleistocene remains. (Spring, odd years)

188 **Primatology** (3) Brooks, Teleki
Physical and behavioral characteristics of the various primate groups and their relationship to human physical and cultural evolution. Frequent meetings at the National Zoological Park. (Fall, odd years)

*190 **Ethnohistory** (3) Wagner, Humphrey
(Formerly Anth 184)
Reconstruction of the history of a selected preliterate society through the analysis of historical documents, oral traditions, archeological remains, and other indirect sources. Specific topic to be announced in the *Schedule of Classes*.

195 **Undergraduate Research** (arr.) Staff
Individual research problems to be arranged with a member of the faculty. May be repeated for credit. Prerequisite: concurrent or previous registration in Anth 198.

198 **Senior Seminar** (3)
Study and discussion of selected major works in anthropology. Prerequisite: Anth 101 and senior standing in anthropology.

Third Group

200 **Methods in Socio-Cultural Anthropology** (3) Krulfeld
(Formerly Anth 193, Anthropological Methods)
Approaches to library and field research. Conceptual bases and biases in the delineation of problems and in the selection, analysis, and organization of data. Students will design and carry out their own field projects in the Washington area. (Spring)

201 **Proseminar: Biological Anthropology** (3) Brooks
Theories, methods and current issues in the various subdisciplines of biological anthropology. (Spring)

202 **Proseminar: Socio-Cultural Anthropology** Krulfeld, Simons
(Formerly Seminar: Recent Trends in Anthropology)
Major topics in contemporary social and cultural anthropology, stressing current journal and monograph materials. (Spring)

203 **Proseminar: Anthropological Linguistics** (3) Golla
(Formerly Anth 261)
Contemporary anthropological studies of language in biological, social, and historical perspectives. (Fall)

204 **Proseminar: Method and Theory in Archeology** (3) Humphrey, Brooks
(Formerly Anth 265)
Survey of the most recent archeological techniques and theoretical

* Next offering of the Anthropology and History Departments.

approaches to reconstructing and interpreting the cultures of the past. (Fall)

*211 **Seminar: Problems in Conservation** (3) Rose
Individual conservation projects to determine composition, construction, decomposition of materials, and possible stabilization techniques. Conservation laboratory experience. Prerequisite or concurrent registration: Art or Anth 212. (Fall)

*212 **Advanced Conservation Techniques** (3) Staff
Physical structure, molecular biology, and chemistry of ethnographic materials. Chemistry and physics underlying techniques used to conserve these materials. Prerequisites: Art or Anth 293, Chem 50 and permission of instructor. (Fall)

†215 **Field Methods in Comparative Cultural Ecology: Mesoamerican Archeology** (6) Humphrey, Mergen
Field study in Mexico. Directed individual research in the history of Mesoamerican culture. (Summer)

‡254 **Seminar: Folklore in America** (3) Mergen
Various aspects of American traditional culture, including the theory and methodology of folklore research

255–56 **Anthropology for Teachers** (4–4) Lanouette and Saff
Formerly Teaching Anthropology Through Washington's Resources
Examination of current research, innovative classroom techniques and materials. Sessions with anthropologists at museums, laboratories and zoos. Designed for middle and secondary school social science and science teachers. May not be taken for credit by M.A. candidates in anthropology.

258 **Seminar: Anthropology of Art, Aesthetics, and Symbolism** (3) Wagner, Krulfeld
Anthropological approaches to aesthetic problems in the context of ethnographic materials.

260 **Seminar: Culture Theory** (3) Krulfeld, Wagner
Contemporary theories of culture.

262 **Seminar: Applied Anthropology** (3) Lewis
Use of anthropological methods and techniques in such specific fields as government, community development, land reform, law, and medicine. (Fall)

263 **Seminar: Culture Contact and Change** (3) Simons
Change in Western and non-Western cultures; emphasis on general processes of change and interaction between simpler and more complex societies. (Fall)

264 **Seminar: Anthropological Museum Techniques** (3) Humphrey
Principles of anthropological collection, classification, preservation, identification, interpretation, and exhibition of specimens; research

* Joint offering of the Anthropology and Art Departments.
† Interdepartmental course offered by the American Studies Program and the Departments of Anthropology and Geography and Regional Science
‡ Joint offering of the Anthropology Department and the American Studies Program.

and instructional use of the museum. Field trips to area museums. (Fall)

266 **Seminar: Technology** (3) Humphrey, Lewis

Cross-cultural examination of the form, function, meaning, and use of material culture and the behavior patterns involved in its production. (Spring, odd years)

267 **Seminar: Economic Anthropology** (3) Krulfeld

Comparative study of systems of production, distribution, and consumption. (Fall)

268 **Seminar: Peasant Society** (3) Krulfeld

Cross-cultural analysis of peasant societies, including their manner of functioning within their larger social, economic, and cultural context. (Fall)

269 **Seminar: Structural Problems** (3) Simons

Comparative survey of principles of descent, kinship terminology, and formation of descent groups; problems of variation and change in kinship systems and development of kinship models. (Spring)

*270 **Seminar: Museum Exhibiting** (3) Mahoney

Selected museum exhibiting problems in the social and natural sciences, including methods and techniques of exhibition, problems of museum communication and education. Taught at the Smithsonian Institution. (Fall)

272 **Seminar: Topics in Latin American Anthropology** (3) Wagner, Koch-Weser

Specific topics, to be announced, will be selected from the following: mythology and ritual, artistic traditions, ethnic groups, Andean or Tropical Forest social organization, peasant movements and land reform, native cultures during the Colonial period, archeological problems.

273 **Seminar: Urban Anthropology** (3) Hertz

Anthropological investigations of city life from Neolithic beginning to the present. Study of occupational, class, and ethnic communities within cities as well as ethnographies of entire cities. Adaptation of traditional field methods to urban settings. (Spring)

274 **Seminar: Topics in American Culture** (3) Hertz

Specific topic or topics to be announced in the *Schedule of Classes*. (Fall)

282 **Seminar: Advanced Archeology—New World Prehistory** (3) Humphrey, Stuart

Current archeological problems relating to the origin and development of aboriginal cultures. Specific topic to be announced in the *Schedule of Classes*. May be repeated for credit.

283 **Seminar: Topics in Old World Anthropology—Physical Anthropology and Archeology** (3) Brooks

Current problems in relation to materials from the old world. Specific area to be announced in the *Schedule of Classes*. (Spring)

* Joint offering of the Anthropology Department and the American Studies Program.

287 **Seminar: Problems in Latin American Civilization** (3) Staff
Interdisciplinary seminar partially guided by a specialist within the methodology of his or her chosen discipline; each student writes a report on some aspects of a selected key theme. Admission by permission of instructor. (Spring)

290 **Advanced Museum Research** (3) Staff
Supervised individual research and or field work at the Smithsonian Institution or other area museums, arranged in consultation with the museum and the Anthropology Department. Admission by permission of the department chairman. May be repeated for credit. (Fall and spring)

291 **Seminar: Museology** (3) Evans
Twentieth century development of museums—natural history, science and history; their history, philosophy, and organization; their civic importance and administrative problems. (Spring)

*292 **Introduction to Conservation** (3) Rose
Method and theory of conservation, including fine arts, ethnographic archeological and monuments conservation; handling, restoration preservation, storage, and display of museum specimens; basic materials of ethnographic objects and the ways they react to their environment. The fall class is only open to conservation students and those who will be registered for Anth 293 in the spring. The summer course deals with conservation of archeological materials. (Fall, spring, and summer)

*293 **Conservation Laboratory Techniques** (3) Rose
Examination procedures and analytical techniques used in the conservation laboratory, including discussion of chemical composition of solvents, adhesives, coating, and filling materials used in the restoration and stabilization of museum specimens. Prerequisite: Anth 292, Chem 13 or equivalent. Taught at the Smithsonian Conservation Laboratory. Admission by permission of instructor. (Spring)

†294 **Field Research in Archeology** (3) Staff
Field techniques, including excavation, recording, photography, preservation, laboratory analysis, and interpretation. (Fall, spring, and summer)

295 **Research** (arr.) Staff
May be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

ART

Professors L.P. Leite *(Emeritus)*, F.S. Grubar, D.H. Teller
Professorial Lecturers Grace Evans, D.A. Brown, L. Miller
Associate Professors L.F. Robinson *(Chairman)*, H.I. Gates, J.L. Lake, J.F. Wright, Jr.

* Interdepartmental course offered by the Departments of Anthropology and Art.
† Joint offering of the Anthropology Department and the American Studies Program. The summer offering is in cooperation with St. Mary's College, the Smithsonian Institution, and the St. Mary's (Md.) County Archeologist

Adjunct Associate Professor Grose Evans
Associate Professorial Lecturers B.S. Glassman, A.D. Ullberg
Assistant Professors W.T. Woodward, F. Griffith, A.H. Smith, T. Ozdogan, J.C. Anderson, D.M. Hitchcock, C.C. Costigan, B. Von Barghahn, S.B. Molina, M.P. Lader
Adjunct Assistant Professors E.R. Williams, C.R. Rose
Assistant Professorial Lecturers E.L. Battaglia, E.P. Lawson, B.D. Lourie, H.H. Hudgins, Jr., A. Seremetis, K. Montgomery, J. Morrell, Jr., L. Smith, A.B. Barnhart, A.L. Glassman
Curator, Dimock Gallery L.D. Miller

Bachelor of Arts with a major in art history (departmental)—The following requirements must be fulfilled:

1. The general requirements as stated on pages 72–73, 79–85. Students should consult their departmental advisor regarding courses to be taken to satisfy requirements.
2. Prerequisite courses—Art 31–32 or 71–72.
3. Required courses in related areas—Art 137; Fren 1–2, 3–4, or Ger 1–2, 3–4; Phil 162; or equivalent.
4. Required courses in the major—Art 101 or 102, 104 or 105, 106 or 107, 108, 109, 110, 112, 113 or 114, 117 or 118 or 119, nine additional semester hours in second-group art history courses.
5. A maximum of nine semester hours in Fine Arts, including Art 137, is permitted.

Graduation with Special Honors: students should apply to the chairman of the department at the beginning of their senior year. Before admittance to the program they must pass a reading examination in either French or German. Upon acceptance, candidates will be assigned to one or more faculty advisors under whose direction they will undertake a supervised program of study.

Bachelor of Arts with a major in Fine Arts (departmental)—The following requirements must be fulfilled:

1. The general requirements as stated on pages 72–73, 79–85. Students should consult their departmental advisor regarding courses to be taken to satisfy requirements.
2. Prerequisite courses—Art 21–22, 41–42 (students concentrating in photography substitute Art 23–24 for 41–42).
3. Required courses in related areas—Art 31–32, six additional semester hours in second-group art history courses.
4. Required courses in the major—27 semester hours of first- or second-group Fine Arts courses in eight areas—ceramics, advanced design, advanced drawing, graphics, painting, photography, sculpture, and visual communication. Students choose one of these areas as a primary area of concentration, in which 12 semester hours are required. The remaining 15 semester hours must be distributed among any three other areas. (Transfer students must take at least 12 semester hours of second-group Fine Arts courses in residence at this University.)

Fine Arts seniors may apply for graduation with Special Honors. To be accepted into this program, students must satisfy the general requirements (see page 50). They should apply in writing to the chairman of the Art Department at the beginning of their senior year. Upon acceptance, each candidate will be assigned one or more faculty advisors under whose direction a project in a special area of interest will be undertaken.

Bachelor of Arts with a major in classical archeology and anthropology (departmental)—An interdepartmental major offered by the Art and Anthropology Departments. The following requirements must be fulfilled:

1. The general requirements as stated on pages 72–73, 79–85. Students should consult their departmental advisor regarding courses to satisfy requirements.
2. Prerequisite course—Anth 1–2.
3. Required courses in the major—Anth 152, 158, 177, 183; Art 101, 102, 103, 111; Hist 109, 110. (A reading knowledge of French and German is recommended.)

Bachelor of Arts with a major in classical archeology and classics (departmental)—An interdepartmental major offered by the Art and Classics Departments. The following requirements must be fulfilled:

1. The general requirements as stated on pages 72–73, 79–85. Students should consult their departmental advisor regarding courses to be taken to satisfy the requirements.
2. Prerequisite courses—Clas 1–2, 3, 4; or Clas 11–12, 13–14.
3. Required courses in the major—Art 101, 102, 103, 111; Hist 109, 110. 14 semester hours of second-group courses in Greek or Latin, including Clas 136. (A reading knowledge of French and German is recommended.)

Master of Arts in the field of art history—Prerequisite: a Bachelor of Arts degree with a major in art history from this University, or an equivalent degree. Applicants from other institutions must present scores on the Graduate Record Examination to the Office of the Graduate School of Arts and Sciences.

1. *With a concentration in classical art and archeology, medieval art, Renaissance and Baroque art, contemporary art, and American art*—Required: the general requirements, pages 85–86, 36 hours of course work including six semester hours of thesis research. As many as possible of the 36 semester hours of course work should be in third-group courses, not more than six hours may be taken in museum-related courses. Students must maintain a quality-point index of at least 3.25. A reading knowledge examination in German or French must be passed before completion of the first nine semester hours of course work. A written general Master's Comprehensive Examination must be passed before students can enroll for the six semester hours of thesis research. A written thesis must be submitted to and approved by the faculty.

2. *With a concentration in museum training*—Required: the general requirements, pages 85–86, 42 semester hours of course work as follows: 12 hours of art history courses, taken before acceptance into the museum program: Art 201–2 and 271–72, and 18 additional hours of art history courses selected in consultation with the advisor, not more than six hours to be taken in museum-related courses. Students must maintain a quality-point index of at least 3.25. A reading knowledge examination in German or French must be passed before completion of the first nine semester hours of course work. Students are required to pass the general written Master's Comprehensive Examination in Art History and may also be required to pass a written comprehensive examination in Museology as part of the requirements for the internship.

Acceptance into this program as a degree candidate is provisional, pending satisfactory completion of 12 semester hours of graduate art history courses and the approval of the Graduate Programs Committee (Department of Art).

The Art Department has established a program of study in affiliation with a number of museums and galleries including the Corcoran Gallery of Art, the Hirshhorn Museum and Sculpture Garden, the Museum of African Art, the National Collection of Fine Arts, the Phillips Collection, the Renwick Gallery and the Textile Museum.

3. *With a concentration in museum administration*—For details consult the chairman of the department.

Master of Arts in the field of classical archeology, classics, and history (an interdepartmental degree program offered by the Departments of Art, Classics

and History)—Prerequisite: A bachelor's degree with a background in classical archeology and either Greek or Latin. Applicants from other institutions must present scores on the Graduate Record Examination to the Office of the Graduate School of Arts and Sciences.

Required: the general requirements, pages 88–96, and 30 semester hours of course work, including six semester hours of thesis research (as many as possible should be third-group courses) selected in consultation with the appropriate advisor from the Departments of Art, Classics, and History. Candidates must pass a reading knowledge examination in French or German. All candidates are required to pass a general Master's Comprehensive Examination.

Master of Fine Arts in the field of ceramics, design, graphics, painting, photography, sculpture, or visual communication—Prerequisite: a Bachelor of Fine Arts or a Bachelor of Arts degree with a major in Fine Arts in the field of ceramics, design, drawing, graphics, painting, photography, sculpture or visual communication. A 3.00 undergraduate grade-point average (on a 4.00 scale) and departmental approval of the applicant's work is required. This should consist of slides of at least 10 drawings, including figure studies, and four to six paintings, prints, sculptures, ceramics, or photographs. Students planning to do graduate work in graphics or painting must have completed 12 semester hours of drawing at the undergraduate level before admittance to the master's program.

Required: the general requirements, pages 88–96. As a final requirement Master of Fine Arts candidates must take Art 147 or three additional hours of course work selected in consultation with the advisor. As many as possible of the remaining 24 hours of course work should be in third-group courses, only 18 hours of which may be in one area, the remaining six hours are to be selected from related areas in consultation with the advisor. A creative thesis consisting of the execution of original works of art in ceramics, design, graphics, painting, photography, or sculpture will be completed under the supervision of a thesis advisor. In addition, the thesis must include a written statement and analysis of artistic purpose, subject to the approval of the thesis advisor and a second faculty reader. A representative portion of the work illustrating the creative thesis may be retained by the University at the discretion of the thesis director in agreement with the second reader. For details, consult the chairman of the department.

Doctor of Philosophy in the field of art history—Required: the general requirements, pages 88–91, 97–99, and a Master of Arts degree in art history. Candidates must also pass written examinations in French and German, a General Examination in art history, an examination in the area of specialization, and examinations in two areas related to the area of specialization. Students plan their own programs in consultation with a departmental committee.

Areas of Specialization: classical art and archeology, Medieval art, Renaissance art, Baroque art, eighteenth-century art, nineteenth-century art, twentieth-century art, and American art.

Bachelor of Arts in Education with a teaching field in art—Prerequisite: the education curriculum, pages 111–12.

Required: the art option and professional courses listed on pages 115–16.

ART HISTORY

First Group

1 **Introduction to Art** (3) Von Barghahn and Staff
General principles, theories, and techniques. (Fall, spring, and summer)

31–32 **Survey of Western Art** (3–3) Robinson and Staff
A foundation for further study in the history of art. Art 31: prehistoric to Gothic art. Art 32: proto-Renaissance to contemporary art. (Art 31 and 32—fall and spring)

71–72 **Introduction to the Arts in America** (3–3) Grubar and Staff
Art 71: Colonial beginnings to the Republican Age. Art 72: 19th century to the present. (Art 71 and 72—fall and spring)

Second Group

101 **Greek and Roman Architecture** (3) Williams
(Fall)

102 **Greek and Roman Sculpture** (3) Williams
(Spring)

103 **Classical Iconography** (3) Williams
Origin and development of myths in classical art.

104 **Renaissance Art in Italy I** (3) Grace Evans
Early developments from the 13th to the 15th century. (Fall)

105 **Renaissance Art in Italy II** (3) Grace Evans
High Renaissance and Mannerism. (Spring)

106 **Renaissance Art in the North I** (3) Hitchcock
Northern painting from van Eyck through the Antwerp Mannerists. (Fall)

107 **Renaissance Art in the North II** (3) Hitchcock
Northern painting and graphics from Durer through Brueghel. (Spring)

108 **18th-Century Art in Europe** (3) Hitchcock
(Spring)

109 **19th-Century Art in Europe** (3) Robinson
(Fall and spring)

110 **Contemporary Art** (3) Lader
(Fall and spring)

111 **Classical Archeology** (3) Williams
Archeological monuments of classical civilizations, with intensive study of one or more areas selected from architecture, sculpture, painting, or minor arts.

112 **Art of Egypt and the Ancient Orient** (3) Williams
Study of the art of Mesopotamia, Anatolia, Egypt, and Persia. (Spring)

113 **Baroque Art in Italy** (3) Grose Evans
(Spring)

114 **Baroque Art in the North** (3) Hitchcock
Holland, Flanders, Spain, France, Germany, and England. (Fall)

115 Christian Iconography (3) — Anderson
Origins and development of Christian symbols and themes from early Christian to modern times.

116 Islamic Art (3)

117 Medieval Art I (3) — Anderson
Early Christian and Byzantine. (Fall)

118 Medieval Art II (3) — Anderson
Romanesque and Gothic. (Spring)

119 Pre-Romanesque Art in the North (3) — Anderson
Merovingian and Carolingian. (Spring)

120 Art of China and Japan (3) — Von Barghahn
(Fall)

121 Spanish Painting from the Catalan Frescoes through El Greco (3) — Von Barghahn

122 History of Spanish Painting from Ribera through Goya (3) — Von Barghahn

129–30 Principles of Museum Work (3–3) — Lawson
Introduction to the history and development of museums; problems of museum administration, connoisseurship, cataloguing, installation, conservation, and educational service. (Academic year)

140 Gothic Architecture (3) — Staff

145 Folk Arts in America (3) — Grubar
Ceramics, woodcarving, ironwork, decorative painting, weaving, and other crafts.

147 Pre-Columbian Art (3) — Staff

148 19th-Century American Painting (3) — Grubar, Grose Evans
(Fall)

149 19th-Century American Sculpture (3) — Grubar
(Spring)

150 Landmarks in American Art (3) — Grubar

156 Early Medieval Sculpture (3) — Evans

161 Monuments of Christian Rome (3) — Anderson

162 The Art of Oriental Rugs (3) — Staff

165 African Art (3) — Staff

167 French Painting: 15th and 16th Centuries (3) — Von Barghahn

169–70 History of Decorative Arts (3–3) — Staff
(Formerly History of Furniture)
(Academic year)

*173 **History of the Cinema** (3) — Kernan
An examination of motion picture history in terms of socially structured narrative from Griffith to Godard. (Spring)

Third Group

201–2 **Museum Projects** (3–3) — Staff
Open only to candidates for the degree of Master of Arts in the field of museum training.

203 **Primitive Art** (3) — Staff
(Spring)

207 **Modern Architecture** (3) — Lader
Europe and America. (Fall)

†211 **Seminar: Problems in Conservation** (3) — Rose
Individual conservation projects to determine composition, construction, decomposition of materials, and possible stabilization techniques. Conservation laboratory experience. Prerequisite: Art or Anth 212. (Fall)

†212 **Advanced Conservation Techniques** (3) — Staff
Physical structure, molecular biology, and chemistry of ethnographic materials. Chemistry and physics underlying the techniques used to conserve these materials. Prerequisite: Art or Anth 293, Chem 50, and permission of the instructor. (Fall)

213 **Museum Administration and Government** (3) — Staff

214 **Museum Administration and Trusteeship** (3) — Staff

216 **Medieval Painting** (3) — Grace Evans
Painting and the decorative arts.

217–18 **Problems in Museum Work** (3–3) — Ullberg

‡220 **Seminar: Baroque Art of the 17th Century** (3) — Hitchcock
A reading knowledge of Italian is desirable for the Italian area and German for the northern area. (Spring)

‡221 **Seminar: Renaissance Art** (3) — Staff
A reading knowledge of French, German, or Italian is desirable, depending on the specific area. (Fall and spring)

‡243 **Seminar: American Art** (3) — Grubar
(Fall and spring)

‡244 **Seminar: 19th-Century European Art** (3) — Robinson
Reading knowledge of French desirable

‡245 **Seminar: 20th-Century European Art** (3) — Lader

‡246 **Seminar: Classical Art** (3) — Williams

‡247 **Seminar: Medieval Art** (3) — Anderson

* Joint offering of the Art and Speech and Drama Departments
† Joint offering of the Art and Anthropology Departments.
‡ Specific area announced in the Schedule of Courses. May be repeated for credit if the specific area covered is different.

248 **Independent Research in Art History** (3)
(Fall and spring)

261 **Seminar: Problems in Art History** (3) Staff
Recommended for art history majors, open to limited number of qualified undergraduates, with permission of instructor. Theory, criticism, or methodology of art history. May be repeated for credit. Topic to be announced in *Schedule of Classes*. (Fall and spring)

271–72 **Museum Techniques** (3–3) Staff
Open only to candidates for the degree of Master of Arts in the fields of museum training and museum studies. Practical work to be determined by Museum Training Committees at the institutions involved. (Academic year)

*284 **Seminar: Studies in American Art and History** (3) Staff
Exploration of selected problems and themes in American cultural history involving the use of artistic materials in different media; emphasis on methodology and analytic techniques. (Spring)

289–90 **Thesis Research** (3–3) Staff
(Fall and spring)

†292 **Introduction to Conservation** (3) Rose
Method and theory of conservation, including fine arts, ethnographic, archeological, and monuments conservation, handling, restoration, preservation, storage, and display of museum specimens; basic materials of ethnographic objects and the ways they react to their environment. The fall section is open only to conservation students and to those who plan to register for Art 293 in the spring. (Fall and spring)

†293 **Conservation Laboratory Techniques** (3) Rose
Discussion (2 hours), laboratory (6 hours). Examination procedures and analytical techniques used in the conservation laboratory, including discussion of chemical composition of solvents, adhesives, coating, and filling materials used in the restoration and stabilization of museum specimens. Taught at the Smithsonian Conservation Laboratory. Prerequisite: Anth 292, Chem 13. (Spring)

Fourth Group

Limited to art history doctoral candidates. Offered as the demand requires.

‡385–86 **Readings in Art History** (3–3)

‡398 **Advanced Reading and Research** (arr.)
For students preparing for the doctoral examination.

‡399 **Dissertation Research** (arr.)

---

* Joint offering of the Art Department and the American Studies Program in affiliation with the National Portrait Gallery of the Smithsonian Institution.
† Interdepartmental course offered by the Art and Anthropology Departments.
‡ May be repeated for credit

FINE ARTS

Departmental prerequisite: Art 21–22 and 41–42 (students concentrating in photography substitute Art 23–24 for 41–42).

First Group

***21-22 Design I: Basic (3–3)** — Costigan, Teller

Fundamental studies of principles and elements of design. Art 21: study of two-dimensional design. Art 22: three-dimensional studies. Art 21: Laboratory fee, $15. Art 22: Laboratory fee, $21. (Art 21 and 22—fall and spring)

23 Introduction to Photography (3) — Staff

Introduction to the principles of exposure and development of films and papers. Emphasis on creative expression. Laboratory fee, $36. (Academic year)

24 Fundamentals of Photography (3) — Lake

Film developers, types and effects on films. Emphasis on control for creative expression. Prerequisite: Art 23. Laboratory fee, $36. (Academic year)

41–42 Drawing I (3–3) — Wright and Staff

Elementary investigation of concepts of drawing, both traditional and contemporary, leading to perception, analysis of form in light and space; instruction in the use of graphic materials and media; exercises in composition. Material fee, $24 per semester. (Art 41 and 42—fall and spring)

51–52 Ceramics I (3–3) — Smith

Working with clay as an art form. Basic techniques of handbuilding, kilnfiring, clay and glaze making. Laboratory fee, $24 per semester. (Academic year)

57–58 Graphics I (3–3) — Griffith, Wright

Exploration of the methods of intaglio, relief, printing, and other composite processes. Material fee, $21 per semester. (Academic year)

61–62 Water Color (3–3) — Staff

Painting in transparent and opaque water color and in acrylic. Experimentation, figurative and landscape. (Academic year)

65–66 Painting I (3–3) — Smith and Staff

Emphasis on personal expression with exposure to a variety of styles. Application of design principles to easel painting. Prerequisites: Art 21, 41. Material fee, $15 per semester. (Academic year)

81–82 Sculpture I (3–3) — Gates

Three-dimensional design. Basic sculptural techniques: modeling, carving, and construction. Media include wood, clay, stone, plaster. Laboratory fee, $24 per semester. (Academic year)

---

* Required of all Fine Arts majors.



Second Group

Second-group art courses may be repeated for credit with approval of department.

123–24 Individual Problems (3–3) — Staff

Emphasis on problems and materials of specific interest to the student in any area of Fine Arts. Laboratory fee depending on area chosen.* Prerequisite permission of instructor. (Academic year)

125–26 Painting II (3–3) — Smith

Alteration of personal expression and structured problems dealing with still-life and the figure. Use of acrylic and oil. Material fee, $15 per semester. (Academic year)

127–28 Painting III (3–3) — Woodward

Studies in the interpretation of the figure and still-life. Emphasis on color, space, planes, modulations. Alla prima and mixed techniques. Material fee, $15 per semester. (Academic year)

131–32 Ceramics II (3–3) — Ozdogan

Continuation of basic ceramic building techniques and laboratory activities. Introduction to wheel-throwing, clay and glaze test studies. Laboratory fee, $54 per semester. (Academic year)

133 Ceramic Decoration (3) — Ozdogan

Aesthetic and technical development of surface decoration, with experimental projects in sgraffito, nishima, engobe, majolica, underglaze, overglaze, and relief techniques. Laboratory fee $54. (Fall)

134 History of Photography (3) — Staff

(Spring)

135–36 Advanced Water Color (3–3)

Development of techniques of water color, concentration on special projects. (Academic year)

137 Workshop in Materials, Methods, and Techniques (3) — Woodward, Smith

Technical investigation of painting methods from the 14th century to the present. Preparation of grounds, media, underpainting, glazing. Laboratory fee, $15. (Fall and spring)

138 Graphics: History and Practice (3) — Griffith

Laboratory fee, $21.

139 Design in Fiber (3) — Costigan

Emphasis on individual expression in two- and three-dimensional fiber works, with exposure to a variety of styles, attitudes, and materials. Prerequisite: Art 21–22 or permission of instructor. Laboratory fee, $9.

141 Interior Design (3) — Teller and Staff

142 House Planning (3) — Staff

* Schedule of Fees: Ceramics—$54; 2-D Design—none; 3-D Design—$24; Drawing—$24; Graphics—$21; Sculpture—$24; Typography—$30; Painting—none; Photography—$9; Visual Communication—$30.

143–44 **Serigraphy** (3–3) — Teller

Fine Arts printmaking using serigraphic techniques. Utilization of all basic techniques; emphasis on aesthetic properties of prints. Prerequisite: Art 21 and 41–42. Laboratory fee, $21 per semester. (Academic year)

146 **Ceramic Restoration** (3) — Ozdogan

All methods and techniques. Student projects include surface and structural repairs with laboratory tests and activities. Laboratory fee, $21. (Summer)

151–52 **Ceramics III** (3–3) — Ozdogan

Developing quality and creativity with emphasis on achieving high standards of craftsmanship in hand-building and wheel throwing. Laboratory tests and activities. Laboratory fee, $54 per semester. (Academic year)

153–54 **Graphics II** (3–3) — Griffith, Wright

Advanced relief, intaglio, and other composite processes. Prerequisite: Art 57–58. Material fee, $21 per semester. (Academic year)

157–58 **Graphics III** (3–3) — Griffith

Exploration of combined techniques and mixed media. Prerequisite: Art 153–54. Material fee, $21 per semester. (Academic year)

159–60 **Drawing II** (3–3) — Wright and Staff

Study and application of master drawing techniques. Investigation of perspective and anatomy. Emphasis upon conceptual development of personal style. Prerequisite: Art 41–42. Material fee, $24 per semester. (Academic year)

163–64 **Visual Communication I** (3–3) — Molina

Layouts and execution in client-presentation form of various graphic design projects: brochures, bookjackets, displays, title graphics for film media. Material fee, $21 per semester. (Academic year)

*166 **Advanced Drawing Techniques** (3) — Smith and Staff

Prerequisite: Art 41–42. Laboratory fee, $21.

171 **Typography I** (3) — Molina

Techniques of hand lettering, traditional and contemporary. Exploration of the decorative potential in lettering. Material fee, $21. (Fall)

172 **Typography II** (3) — Molina

Study of type classification, recognition, and adaption. Methods of copy fitting and type reproduction processes. Typographic layout and specification. Material fee, $21. (Spring)

174 **Visual Communication II** (3) — Molina

Limited to seniors. Material fee, $21.

†175 **Lithography** (3) — Staff

Material fee, $21.

---

* Specific area announced in the *Schedule of Classes*. May be repeated for credit if the area covered is different.

† May be repeated for credit if the area covered is different.

177–78 **Survey of Printing and Illustration** (3–3) Staff

Exposure to a maximum range of illustrative processes, both practical and theoretical. Technical aspects of commercial printing processes; methods of preparation of artwork, photographs, and typographic proofs for commercial reproduction. (Academic year)

179–80 **Sculpture II** (3–3) Gates

Creation of three-dimensional forms using combination of techniques: wood, steel, plastic and plaster. Prerequisite: Art 81–82. Laboratory fee, $24 per semester. (Academic year)

181 **Introduction to Color Photography** (3) Lake

Use of filters for creating and correcting color shifts with emphasis on color as subject matter. Prerequisite: Art 23–24 or permission of instructor. Laboatory fee, $36. (Fall)

182 **Intermediate Photography** (3) Lake

Filters and their use with black-and-white film as means of tone control. Emphasis on creative expression. Prerequisite: Art 23–24 or permission of instructor. Laboratory fee, $36. (Spring)

183 **Intermediate Black and White Photography** (3)

Emphasis on role of ideas in black and white photography. Critiques designed to encourage development of an individual style. Prerequisites: Art 23–24 or permission of instructor. Laboratory fee, $30. (Fall and spring)

185–86 **Painting and Drawing** (3–3)

Techniques of drawing and painting in oil, acrylic, and water color. Work from life model and still life. Material fee, $15 per semester.

189–90 **Sculpture III** (3–3) Gates

Advanced study in concepts and materials through creation of three-dimensional forms concentrating on relevance of scale and media. Relationship of sculpture to the environment. Prerequisite: Art 179–80. Laboratory fee, $24 per semester. (Academic year)

193–94 **Film Making** (3–3)

Basic techniques and procedures in film making. Each student will create a short film. Art 193 is prerequisite for Art 194. (Academic year)

*195 **Documentary Photography** (3) Battaglia

Historical development of documentary photography. Completion of two projects required. Laboratory fee, $36. Prerequisite: Art 23–24 or permission of instructor. (Fall)

197–98 **History of Photography** (3–3)

Discussion of major figures and movements in the history of photography.

Third Group

All third-group art courses may be repeated for credit with the approval of the department.

---

* Interdepartmental course offered by the Art and Journalism Departments.

205 **Advanced Photography: Zone System Tests** (3) Lake
Tone control through exposure development tests. Completion of laboratory manual required. Prerequisite: Art 181–82 or permission of instructor. Laboratory fee, $36 per semester. (Fall and spring)

206 **Photography: Special Projects** (3) Lake and Staff
Prerequisite: Art 23-24, 181-82, or permission of instructor. Laboratory fee, $36. May be repeated for credit.

208 **Advanced Photography** (3)
Advanced problems in photography; emphasis on individual development. Prerequisite: Art 181–82 or permission of instructor. Laboratory fee, $30. (Fall and spring)

209-10 **Exhibition and Display Design** (3–3) Miller

224 **Ceramic Sculpture** (3) Ozdogan
Principles of sculptural design in clay. Bibelot, garden ceramics, and figurative forms. Laboratory fee, $54. (Fall)

225 **Advanced Ceramic Decoration** (3) Ozdogan
(Formerly Special Projects in Ceramics)
Specially designed projects in relief, intaglio, engobe, underglaze, majolica, and overglaze. Laboratory fee, $54.

226 **Architectural Ceramics** (3) Ozdogan
Advanced studies in ceramic murals and sculpture oriented toward indoor and outdoor architectural concepts. Laboratory tests and activities. Laboratory fee, $54.

231–32 **Design III** (3–3) Gates
New media and techniques in three-dimensional design. Laboratory fee, $24 per semester. (Academic year)

234 **Design IV** (3) Staff
Specifications and fabrication of materials in three-dimensional presentation. (Fall and spring)

235 **Design V: Textile Printing** (3) Teller
Designing and executing textiles using the techniques of silk screen, block print, and batik. (Fall and spring)

248 **Independent Research in Fine Arts** (3)
For master's degree candidates; open to limited number of qualified undergraduates with permission. Independent research arranged in consultation with individual instructor and graduate advisor. May be repeated for credit. Laboratory fee depending on area chosen.* (Fall and spring)

249 **Theory of Design** (3) Costigan
Advanced problems in two- and three-dimensional design. Emphasis on individual conceptual thinking, design process, and finished presentation. Field trips and review of art and design literature.

---

* Ceramics—Ceramics—$54; 3-D Design—none; 3-D Design—$24; Drawing—$21; Graphics—$21; Sculpture—$54; Typography—$30; Painting—none; Photography—$36; Visual Communication—$30; Serigraphic Techniques—$21

Open to all MFA candidates and to seniors with permission of instructor. Laboratory fee, $9.

251–52 Ceramics IV (3–3) — Ozdogan

Advanced individual projects. Directed studies in specific areas. Laboratory tests and activities. Laboratory fee, $64 per semester.

253 Ceramics V (3) — Ozdogan

Establishment of an individual style and specialization. Emphasis on meeting professional standards. Laboratory tests and activities. Laboratory fee, $64.

254 Ceramic Glazes: Calculation and Formulation (3) — Glassman

Laboratory fee, $21.

255–56 Graphics IV: Advanced Serigraphy (3–3) — Teller

Utilization of principles and techniques of serigraphy toward development of personal statement and style. Prerequisite: Art 144–44. Laboratory fee, $21 per semester. (Academic year)

257–58 Graphics V: Etching and Engraving (3–3) — Griffith

Prerequisite: Art 157–58. Material fee, $21 per semester. (Academic year)

259 Graphics VI: Lithography (3) — Wright

Material fee, $21. (Fall and spring)

260 Graphics VII: Relief Printing (3) — Griffith

Material fee, $21. (Fall and spring)

265–66 Painting IV (3–3) — Woodward

Alternatives in pictorial dynamics. Assigned studio and independent problems in alla prima and mixed techniques. Material and model fee, $15 per semester. (Academic year)

267–68 Individual Problems in Photography (3–3) — Lake and Staff

Limited to MFA candidates and qualified undergraduates. Prerequisite: Permission of instructor and approval of project prior to registration. May be repeated for credit. Laboratory fee, $36 per semester. (Academic year)

275 Painting V (3) — Woodward

Development of personal imagery. Individual problems and critiques. Material and model fee, $15.

277–78 Design: Advanced Visual Communication (3–3) — Molina

Design and execution of graphic design projects, including magazine spreads, posters, advertisements, trademarks, letterheads, packages. Psychological and symbolic aspects of design solutions. Laboratory fee, $30 per semester. (Academic year)

279–80 Sculpture IV (3–3) — Gates

Advanced study aimed at development of concept and style. Prerequisite: permission of instructor. Laboratory fee, $24. (Academic year)

281 Sculpture V (3) — Gates

Emphasis on individual sculptural concepts and materials. Prerequisite: permission of instructor. Laboratory fee, $24. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff
Laboratory fee depending on area chosen.* (Fall and spring)

ART THERAPY—GRADUATE PROGRAM

Professors B.I. Levy *(Program Director)*, D.E. Silber *(Associate Director)*
Adjunct Associate Professors H.Y. Kwiatkowska, E. Ulman *(Coordinator of Training)*
Assistant Professor A.R. Bruhn *(Assistant Director)*
Assistant Professorial Lecturers E. Kramer, J. Krash
Lecturers W. Maiorana, K. Williams
Clinical Instructors B.J. Clifford, S. Fishman, L. Gantt, G. Haugan, R.A. Wolff, M.S. Schmal, B. Holly, Jr., M. Kreshover, M. Fleming, P.A. Rossiter-Ravenscroft

Master of Arts in the field of art therapy—Prerequisite: a bachelor's degree, evidence of significant training and or experience in the arts, including painting, drawing, and clay modeling; course work in the behavioral and or social sciences, including personality theory, abnormal psychology, and child psychology.

Required: the general requirements, pages 88–96. Prospective candidates should consult the brochure which describes the program for specific requirements.

Fields of emphasis: adult art therapy, family art therapy, child art therapy, and research.

201 **Introduction to Art Therapy** (3) Ulman
Lectures, presentation of illustrative case material, class discussion of assigned readings. Survey covering range of art therapy practice, personality assessment and treatment approaches, historical development, main theoretical trends. Open only to degree candidates. (Fall)

202 **Case Studies in Art Therapy** (3) Ulman
Discussion of case material provided by students in order to refine methods of working, improve written and oral reports. Instructor and other practitioners may provide supplementary illustrative material. Assigned reading. (Spring)

203 **Technique of Art Therapy** (3) Kwiatkowska, Gantt
Art therapy approaches with individuals and groups of different diagnostic categories in various settings presented through illustrative clinical examples. Students experiment with numerous techniques through the use of art materials. Open only to degree candidates. (Fall)

204 **The Freudian Model in Art Therapy** (3) Kramer, Kwiatkowska, Ulman
Concepts of instinctual drives; ego development; defense mechanisms; sublimation; transference and countertransference, maturation and regression applied to work with children, adults, families, and groups. (Spring)

---

* Studio fee: Basic Ceramics—$24; 3-D Design—none; 4-D Design—$24; Drawing—$21; Graphics—$21; Sculpture—$24; Typography—$36; Painting—none; Photography—$36; Visual Communication—$30; Serigraphy—$21

205–6 **Family Art Techniques** (3–3) Kwiatkowska

Principles of family art therapy as adjunctive and primary treatment; art techniques for evaluation of family dynamics. Students participate in working with families. Prerequisite: ArTh 201 and 203, or 211, or permission of instructor. (Academic year)

207–8 **Art as Therapy with Children** (3–3) Maiorana, Williams

Lectures, presentation of case material, studio work, class discussion of assigned reading. Special considerations of work in art therapy with children will be explored from the theoretical and practical standpoints. Prerequisite: ArTh 201 and 203, or 211, or permission of instructor. (Academic year)

211 **Survey of Art Therapy** (3) Maiorana, Williams

Use of visual arts to enhance personal development; history, theories, range of practice in art therapy. Illustrated lectures, reading, discussion, studio work. For students not intending to specialize in art therapy. Open to advanced undergraduates with permission of instructor. (Fall and spring)

218 **Seminar: Systems of Psychotherapy** (3) Silber

Introduction to theory and technique of psychotherapeutic approaches: psychoanalytic, ego-centered, non-directive, transactional, and others. Original sources surveyed. Prerequisite: ArTh 201 and 203, or 211, or permission of instructor. (Spring)

275 **Group Art Therapy** (3) Ulman, Krash

Fall semester: theory of group process; experience in an art-centered group. Spring semester: application of group process theory and experience to the practice of group art therapy. (Fall and spring)

283–84 **Practicum in Art Therapy** (3–3) Staff

Minimum of 300 hours' field work connected with service to clients. On-the-job supervision supplemented by group supervision from the art therapy staff. Prerequisite: ArTh 201 and 203, or 211. Open only to degree candidates.

285 **Special Projects in Art Therapy** (3) Staff

Individual work based on study, research, or practice. Details to be worked out with each student. Resource people may be called upon to assist as appropriate. May be repeated for credit with approval of advisor.

290–91 **Workshops in Art Therapy** (3–3) Staff

Art therapists and other mental health professionals will conduct four weekend workshops during each semester. Emphasis on the elucidation of concepts of treatment through lecture, discussion, and participation. Students registered in the Art Therapy Program aid in selection of subjects and leaders. Students may register for either 290 or 291, or both. (Academic year)

ASTRONOMY

See **Physics.**

BIOCHEMISTRY—GRADUATE PROGRAMS

Professors B.W. Smith, G.V. Vahouny, J.M. Bailey, A.L. Goldstein *(Chairman)*
Associate Professor G.A. Walker
Assistant Professor L.L. Gallo

Master of Science in the field of Biochemistry—Prerequisite: a bachelor's degree. The undergraduate program must have included the following courses, or equivalent: BtSc 11-12, Chem 11-12, 22, 151-52, 153-54, Phys 1, 2.

Required: the general requirements, pages 88-96, including Bioc 221-22, 227, 261-262, or with the approval of the advisor, from graduate courses in chemistry, microbiology, physiology, or pharmacology. It is expected that students will complete all of the required work in approximately two years.

Doctor of Philosophy in the field of Biochemistry—Required: the general requirements, pages 88–91, 97–99.

Research fields: amino acid metabolism; animal nutrition; biochemical evolution; biochemistry of cancer; biochemistry of tissue culture; carbohydrate metabolism; chemistry and metabolism of carbohydrates, lipids, proteins; complex lipids; endocrinology; intermediary metabolism, lipids, metabolic relationships of insulin; metabolism, metabolism of connective tissue; metabolism of purines and pyrimidines; neurochemistry; nutrition; protein biosynthesis; protein metabolism; tissue respiration; and vitamins

221-22 **General Biochemistry** (3–4) — Gallo and Staff

A comprehensive course in general biochemistry for graduate students in biomedical sciences and undergraduate students in biology and chemistry. Generally, graduate students *must* register concurrently for Bioc 223 and for Bioc 224. However, graduate students taking Bioc 225-26, ForS 281-82, Micr 241-42 or Phys 223-24 may register for Bioc 221-22 without the laboratory. With specific recommendations by the undergraduate advisor and the department, undergraduate students may register for Bioc 221-22 without laboratory. Prerequisite: Chem 152, 154. (Academic year)

223–24 **Biochemistry Laboratory** (1–1) — Gallo and Staff

Laboratory complement of Bioc 221-22. Concurrent registration in Bioc 221-22 required. Materials fee, $20 a semester. (Academic year)

*225–26 **Biomedical Instrumentation** (4–4) — Smith and Staff

Same as ForS 281-82, Micr 241-42 and Phys 223-24. Comprehensive study of theoretical and practical application of biomedical instrumentation to the separation, identification, and quantification of materials of interest to biomedical and forensic scientists. Laboratory fee, $50. (Academic year)

227 **Biochemistry Seminar** (1) — Bailey

Current literature in biochemistry. Content differs each time course is offered; may be repeated for credit. (Fall and spring)

229 **Biochemistry of Enzymes** (1) — E. Anderson

Two separate courses are offered in alternate years, each covering both general and advanced material; students may register for these in either order and cover the entire content in two years. The full

* An interdisciplinary course offered by the Biochemistry, Forensic Sciences, Microbiology, and Physiology Departments.

content includes practical handling of enzymes, kinetics, reaction mechanisms, active site, isozymes, regulation, and other special topics. Prerequisite: Bioc 221. (Fall)

232 **Protein Chemistry I** (1) Steers, Schechter

An introduction to the theory and methods of protein chemistry, including techniques of protein purification sequencing and characterization by physico-chemical methods. Prerequisite: Bioc 221. (Fall)

233 **Protein Chemistry II** (1) Steers, Schechter

Continuation of Bioc 232. The study of structure function relations in proteins, including methods of analysis of conformation enzymatic activity and the role of proteins in various biological processes. (Spring)

241 **Isotopes** (3) Staff

Theoretical characterization of isotopes and their application in biology and medicine. Attention given to counting, health physics and radiation safety, autoradiography, chromatography. Laboratory fee, $16. (Spring)

252 **Biochemistry of Nervous Tissue Function** (2)

A detailed investigation of the basic biochemical mechanisms involved in nervous tissue function. Topics to be discussed include the molecular structure and function of nervous tissue intra- and inter-neuronal communication mechanisms and brain metabolism; and the biochemistry of various brain dysfunctions. (Spring)

254 **Human Nutrition** (1)

For medical students; open to limited number of graduate students. Application of nutritional principles in humans. (Spring)

256 **Biochemistry of Organ Function** (1) N. Kramer*

For medical students; open to limited number of graduate students. Emphasis on biochemical processes unique to particular organ systems; application of these processes to evaluation of function. (Spring)

262 **Biochemistry of the Lipids** (1) Vahouny

Discussion of topics of current interest including digestion, energy production, biosynthesis, function in specialized tissues and subcellular particles. Content differs each time course is offered; may be repeated for credit. (Spring)

264 **Membrane-Associated Complex Lipids** (1) P. Fishman†

Topics will cover the catabolism and biosynthesis of complex sphingolipids; inherited metabolic diseases associated with abnormal sphingolipid metabolism; altered glycosphingolipid biosynthesis associated with malignant transformation; potential roles of gangliosides as membrane receptors for toxins and hormones; aspects of membrane structure and biochemistry.

266 **Biochemical Genetics and Inherited Metabolic Diseases** (1) C. Merril

For medical students; open to limited number of graduate students. Biochemical aspects of genetics and contributions of molecular biol-

* Professor of Medicine in the G.W.U. School of Medicine and Health Sciences.
† Professor in Biochemistry in the G.W.U. School of Medicine and Health Sciences.

ogy to understanding of human mutations and hereditary diseases. (Spring)

*268 **Muscle Contraction: Physiological and Biochemical Aspects** (2) Walker, Frank

Anatomical, biochemical, pharmacological, and physiological aspects of muscle contraction. Prerequisite: an introductory course in biochemistry and physiology, or permission of the department. (Spring)

295 **Research in Biochemistry** (arr.) Staff

Participation in a project under investigation in the department or one in a related field suggested by the student and approved by the staff. Content differs each time course is offered; may be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff

(Fall and spring)

398 **Advanced Reading and Research** (arr.) Staff

Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff

Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

BIOLOGICAL SCIENCES

Professors R.L. Weintraub *(Emeritus)*, K.F. Parker *(Emeritus)*, **S.O. Schiff** *(Chairman)*, **D.L. Atkins**
Adjunct Professors T.E. Bowman, M.L. Jones, L.S. Kornicker, H.A. Rehder, **F.A. Chace, Jr., R. Manning, C.G. McWright**
Professorial Lecturers K.C. Kates, R.S. Sigafoos, W.A. Shropshire, Jr., **J.C. Petricciani**
Associate Professors R.E. Knowlton, H. Merchant, R.K. Packer, T.L. Hufford
Adjunct Associate Professors W.D. Hope, D.L. Pawson, J. Rosewater, C.F. **Roper, M. Rice**
Associate Professorial Lecturers P.E. Spiegler, J.C.C. Dickens, B.M. Timberlake, **D.A.P. Houston, B. Brown**
Assistant Professors R.P. Seifert, D.E. Johnson, A.L. Mescher, R. Donaldson
Assistant Professorial Lecturer **R.L. Phipps**
Lecturer D.L. Neugebauer

Bachelor of Arts or Bachelor of Science with a major in biology, botany, or zoology (departmental)—The following requirements must be fulfilled.

1. The general requirements as stated on pages 72–73, 79–85. (Students should consult the departmental advisor regarding courses to be taken in satisfying the requirement for meaningful initiation into the social sciences and the humanities.)
2. **Prerequisite courses—BiSc 11–12, or equivalent.**
3. Required courses in related areas—Chem 11–12; Chem 151–52 and 153–54, or 50. (The following courses are strongly recommended: Math 31; Phys 1, 2; two years of French, German, or Russian; Stat 91 or 127.)

* An interdisciplinary course offered by the Physiology and Biochemistry Departments.

4. (a) Required courses for the major in biology—a minimum of 24 semester hours of second-group courses, which should include at least six hours in biology, six in botany, and six in zoology.

(b) Required courses for the major in botany—a minimum of 24 semester hours of second-group courses; a minimum of 12 hours must be taken in botany, and no more than one zoology course may be included.

(c) Required courses for the major in zoology—a minimum of 24 semester hours of second-group courses; a minimum of 12 hours must be taken in zoology, and no more than one botany course may be included.

5. The Bachelor of Science degree requires two semesters of physics in addition to the requirements listed above.

Master of Science in the field of biology, botany, or zoology—Prerequisite: a bachelor's degree with a major in one of the following from this University, or an equivalent degree: (1) *Biology field*—an undergraduate major in biology, botany or zoology; (2) *Botany field*—an undergraduate major in botany or biology; (3) *Zoology field*—an undergraduate major in zoology or biology. The undergraduate program must have included the following courses, or equivalent: Chem 151–52 and 153–54, or 50; Math 31; Phys 1, 2.

Required: the general requirements, pages 86–96. The minimum requirement consists of 24 semester hours of approved course work plus a thesis (equivalent to six semester hours). With the permission of the department a student may elect a program of study consisting of 30 semester hours of approved course work without a thesis.

Master of Arts in the field of Museum Studies, with specialization in the biological sciences, see pages 381–83.

Doctor of Philosophy in the field of biology, botany or zoology—Required: the general requirements, pages 88–91, 97–99, plus satisfactory completion of a Preliminary Examination and the General Examination in four areas of biology. The program of study, fields of study, and tool subjects are determined in consultation with an advisory committee appointed for each candidate.

Research fields in Biology: cell physiology, cytogenetics, developmental genetics, and molecular genetics.

Research fields in Botany: photobiology, phycology, plant ecology, plant physiology (microorganisms), plant physiology (vascular plants), and taxonomy.

Research fields in Zoology: animal ecology, bioenergetics, comparative neuroanatomy, comparative physiology; herpetology; histophysiology; invertebrate zoology, marine biology; radiation biology; taxonomy, anatomy and physiology of mollusks, vertebrate anatomy and taxonomy; vertebrate embryology and morphogenesis; vertebrate ichthyology; and vertebrate physiology.

Bachelor of Arts in Education with a teaching field in biology—Prerequisite: the education curriculum, pages 111–12.

Required: the biology option and the professional courses listed on pages 115–16.

Departmental prerequisite: BiSc 11–12 or equivalent is prerequisite to all second group courses in biology, botany and zoology, except by permission of the instructor.

BIOLOGY

First Group

3–4 **Introductory Biology for Nonscience Majors** (3–3) Schiff

Lecture (2 hours), laboratory (2 hours). Survey of biological principles; emphasis on man as a functional organism in the environment.

Prerequisite to BiSc 4: BiSc 3. Material fee, $18 per semester. (Academic year)

11–12 **Introductory Biology for Science Majors** (4–4) Hufford, Merchant
Lecture (3 hours), laboratory (3 hours). BiSc 11: Biological concepts and principles are demonstrated through consideration of the plant as an organism. BiSc 12: Basic principles of inheritance, development, behavior, physiology, systematics, and evolution, using animals as the subject of investigation; designed to furnish a base for advanced studies in biology and related sciences. Prerequisite to BiSc 12: BiSc 11. Material fee, $24 per semester. (Academic year)

*26 **Environmental Issues** (3) Merchant
An interdisciplinary analysis of selected aspects of the population question, pollution and human health, urban environmental problems, issues of economic growth and development, technology and public policy. (Fall and spring)

33 **Plants and People** (3) Hufford
(Formerly Plants, Man, and Life)
A study of the multidimensional relationship between plants and people, past and present. Lectures, observation-discussion sessions, multi-image audiovisual presentations. (Spring)

Second Group

103 **Marine Biology** (4) Knowlton
Lecture (2 hours), laboratory and field (3 hours), plus some extended field trips. Study of relationships between organisms and physical, chemical, and biological factors of the marine environment. Consideration of the open ocean and coastal eco-systems and man's influence on them. Recommended prerequisite: BiSc 101 or 102, 108, 140. Material fee, $24. (Spring)

107 **Field Biology** (4) Merchant
Field study of behavioral ecology, speciation, territoriality, energy budgets, time and energy budgeting, effects of exposure, and effects of introduction of alien species on flora and fauna of Great Smoky Mountains National Park. (Summer)

108 **Organic Evolution** (3) Seifert
Synthetic theory of organic evolution including treatment of speciation, adaptive radiation, biogeography, population biology, sociality, and human evolution. (Spring)

111 **Introductory Microbiology** (4) Staff
Lecture (2 hours), laboratory (4 hours). Survey of the major groups of microorganisms with emphasis on structure, physiology, ecology, physiologic relationships and economic importance. Prerequisite: one year of chemistry. Material fee, $24. (Fall and spring)

122 **Cell Biology** (3) Donaldson
Structure and function of biological molecules, viruses, and cellular organelles. Prerequisite: one semester of organic chemistry. (Spring)

* Offered jointly by the Division of Experimental Programs and the Departments of Biological Sciences and Geography and Regional Science

123 Cell Biochemistry (3) — **Donaldson**

Introduction to the metabolism of generalized cells of animals, plants, and microorganisms, including energetics, enzymes, respiration, biosyntheses, and regulatory mechanisms. Prerequisite: one semester of organic chemistry. (Fall)

124 Cell Biochemistry Laboratory (2) — **Donaldson**

Designed to illustrate some of the principles and techniques of biochemical experimentation. Prerequisite or concurrent registration: BiSc 123. Material fee, $24. (Fall)

127 Genetics (3) — **Johnson**

Introductory course. Basic aspects of transmission of genetic traits with particular reference to the chemical basis of heredity and gene action. (Fall and spring)

128 Genetics Laboratory (1) — **Johnson**

Study of genetic principles using Drosophila, *E. coli*, and lambda phage. Prerequisite or concurrent registration: BiSc 127. Material fee, $24. (Fall and spring)

129 Cell Physiology (3) — **Staff**

Study of cell processes, including growth, division, differentiation, interactions, aging, movements, energy perception and transduction, luminescence. (Offered alternate years)

130 Cell Physiology Laboratory (1) — **Staff**

Exercises to illustrate some principles and techniques. Prerequisite or concurrent registration: BiSc 129. Material fee, $24. (Offered alternate years)

138 Advanced Genetics (3) — **Johnson**

Emphasis on the use of genetic analysis in solving modern biological problems. Prerequisite: introductory course in genetics. (Spring)

140 General Ecology (4) — **Merchant**

Lecture (3 hours), laboratory and field (3 hours). Introduction to the concepts of limiting factors, biogeochemical cycles, trophic levels, and energy transfer, and their relationship to the structure and function of population, species, communities, and ecosystems. Material fee, $24. (Fall)

144 Aquatic Ecology (4) — **Merchant**

Lecture (3 hours), laboratory and field (3 hours). Principles applied to aquatic systems with special references to physicochemical properties, typical habitats and communities. Laboratory fee, $24. (Spring, odd years)

167 Radiation Biology (3) — **Schiff**

Chemical, physical, and biological aspects of radiation; effects of radiation on cells and organisms, with emphasis on mammals' genetic effects. Recommended: two years of biological sciences, and chemistry or physics. (Fall)

171 Undergraduate Research (arr.) — **Staff**

Admission by permission of the staff member concerned. May be repeated for credit. Prerequisite: Chem 50 or 152, 16 semester hours in Biological Science courses. Material fee, $20 per semester hour. (Fall and spring)

172 **Independent Study in Cell and Molecular Biology** (2) Staff
Prescribed reading list and consultations with staff advisor culminating in a written report and/or examination. Prerequisite: permission of instructor. (Fall and spring)

173 **Independent Study in Developmental Biology** (2) Staff
Prescribed reading list and consultations with staff advisor culminating in a written report and/or examination. Prerequisite: permission of instructor. (Fall and spring)

174 **Independent Study in Organismic Biology** (2) Staff
Prescribed reading list and consultations with staff advisor culminating in a written report and/or examination. Prerequisite: permission of instructor. (Fall and spring)

175 **Independent Study in Genetic and Evolutionary Biology** (2) Staff
Prescribed reading list and consultations with staff advisor culminating in a written report and/or examination. Prerequisite: permission of instructor. (Fall and spring)

176 **Independent Study in Environmental Biology** (2) Staff
Prescribed reading list and consultations with staff advisor culminating in a written report and/or examination. Prerequisite: permission of instructor. (Fall and spring)

181–82 **Senior Seminar** (1–1) Staff
Lectures and discussions on current biological problems. (Academic year)

185 **Human Nutrition** (3) Donaldson
Dietary requirements and their underlying physiological and biochemical bases; composition of natural and modified foodstuffs and additives; social and economic aspects of nutrition. (Fall)

Third Group

206 **Seminar: Radiation Biology** (3) Shropshire
Actions of radiation at subcellular, cellular, and organismal levels; factors modifying radiation damage; practical considerations in radiation exposure. Prerequisite: BISc 107 or equivalent. (Spring)

207 **Seminar: Origin of Life** (3) Staff
Review of experiments and speculations concerning origin of life and molecular aspects of biological evolution. (Spring, odd years)

208 **Bioenergetics** (3) Merchant
Study of energy fixation and transfer in ecosystems and of their role in behavior, evolution, population dynamics, and species interactions. Prerequisite: BISc 140 or equivalent. (Fall, odd years)

209 **Seminar: Principles and Mechanisms of Organic Evolution** (3) Seifert
Principles and mechanisms of evolution in animals and plants; population phenomena, speciation, and evolution above the species level. (Fall, even years)

220 **Seminar: Cell or Plant Biochemistry** (3) Donaldson
(Formerly Seminar: Cell Physiology)
Course content changes each session, alternating between selected

topics in cell biochemistry and plant biochemistry. May be repeated for credit. (Spring, even years)

227 **Seminar: Genetics** (3) Johnson

Current problems in genetics. Students are required to present one seminar covering the full class period. May be repeated for credit. (Fall, odd years)

228 **Population Genetics** (3) Johnson

Consequences of Mendelian inheritance on the population level as exemplified by gene frequencies, random mating, inbreeding, differential fertility and mutations. (Fall, even years)

229 **Cytogenetics** (3) Staff

Behavior of chromosomes in mitosis and meiosis as a basis for the transmission of genes from one generation to the next through reproduction and the influence of cytogenetic processes on the mechanisms of evolution. (Fall)

237 **Water Pollution Biology** (3) Hufford

Review of current research in water quality and water pollution biology. (Fall, even years)

243 **Seminar: Ecology** (3) Merchant

In-depth study of selected topics, including reports on original publications. May be repeated for credit. Prerequisite: BiSc 140 or equivalent. (Spring, even years)

248 **Analysis of Development** (3) Mescher

Survey of current research in experimental morphology, developmental genetics, biochemical development, and developmental endocrinology. Prerequisite: BiSc 140 or equivalent. (Fall)

249 **Seminar: Developmental Biology** (3) Mescher

Discussion and reports on current literature in developmental biology, with emphasis on developmental mechanisms. Prerequisite: at least one course each in developmental biology and genetics. (Spring)

255 **Seminar: Consortium Biology** (2)

Topic to be announced in *Schedule of Classes*. (Spring)

295 **Research** (arr.) Staff

Investigation of special problems. May be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff

(Fall and spring)

Fourth Group

398 **Advanced Reading and Research** (arr.) Staff

Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff

Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

BOTANY

Second Group

105 Local Flora (4) — Parker

Lecture (2 hours), laboratory and field (4 hours). Field and laboratory studies on local flora, emphasis on the woody plants. Material fee $20. (Fall)

106 Field Botany—Lower Plants (4) — Hufford

Lecture (2 hours), laboratory and field (4 hours). Primarily for non-specialists, emphasizing algae, mosses, and ferns. Material fee, $18. (Alternate summers)

109 Developmental Plant Anatomy (4) — Hufford

Demonstration, observation, discussion (6 hours). Initiation and ontogeny of tissues and organs of vascular plants. Material fee, $20. (Spring)

110 Comparative Plant Morphology (4) — Hufford

Demonstration, observation, discussion (6 hours). Evolutionary morphology and life histories as a basis for a phylogenetic study and the critical roles plants have in human welfare. Material fee, $20. (Fall)

125 Flowering Plants (4) — Parker

Lecture (2 hours), laboratory and field (4 hours). Origin, evolutionary development, and principles of systematics of flowering plants. Material fee, $20. (Spring)

135 Plant Physiology (4) — Donaldson

Lecture (2 hours), laboratory (4 hours). Physiology of seed plants with emphasis on growth, development, tropisms, and reproduction. Prerequisite: Chem 11-12. Recommended: Chem 50 or 151-52. Material fee, $24. (Spring, odd years)

137 Horticulture (4) — Parker

Lecture (2 hours), laboratory (4 hours). Basic principles of growth, propagation, and care of ornamental plants. Material fee, $20. (Fall and spring)

141 Plant Ecology (4) — Phipps

Lecture (2 hours), laboratory (4 hours). Several Saturday and weekend field trips required. Material fee, $18. (Fall, even years)

149 Freshwater Algae (4) — Hufford

Observation and discussion (6 hours). Systematics, morphology, physiology, and water quality interrelationships of freshwater algae. Field experience, including at least one weekend field trip. Material fee, $18. (Fall, odd years)

Third Group

221 Seminar: Systematics of Flowering Plants (3) — Parker

Review of current work in various disciplines of systematic research; topics of special interest to participants. May be repeated for credit. (Fall, odd years)

238 **Seminar: Current Topics in Phycology** (3) Hufford
(Spring, odd years)

242 **Seminar: Plant Ecology** (3) Phipps
(Spring, even years)

251 **Freshwater Diatoms** (4) Hufford
Observation and discussion (6 hours). Taxonomy, morphology, and ecology of freshwater diatoms. Field experience. Material fee, $20.
(Spring, even years)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

ZOOLOGY

Second Group

101 **Invertebrate Zoology** (4) Knowlton
Lecture (2 hours), laboratory (4 hours). General survey of invertebrate animals, including classification, morphology, physiology, embryology, and evolutionary relationships among phyla. Material fee, $24. (Fall)

102 **Advanced Invertebrate Zoology** (4) Knowlton
Lecture (2 hours), laboratory and field (4 hours). Study of invertebrate systems (cells, tissues, organs, organisms), with emphasis on functional aspects (physiology and ecology) and taxonomy of important groups. Prerequisite: BiSc 101 or equivalent. Material fee, $24.
(Spring)

104 **Comparative Vertebrate Anatomy** (4) Atkins
Lecture (2 hours), laboratory (4 hours). Evolution and comparative morphology of chordata, stressing recent forms. Material fee, $24.
(Fall and spring)

120 **Animal Behavior** (3) Staff
(Formerly BiSc 210)
Principles of animal behavior, including mechanisms and manifestations from simple reflex systems to social interaction. (Spring, even years)

143 **Animal Ecology** (4) Merchant
Lecture (2 hours), laboratory and field (3 hours). Application of ecological principles to the understanding and manipulation of animal populations. Prerequisite: BiSc 140 or permission of instructor. Laboratory fee, $24. (Spring, even years)

145 **Introduction to Vertebrate Embryology** (4) Mescher
Lecture (2 hours), laboratory (4 hours). Origin and early development of the individual, formation of organ systems. Emphasis on frog, chick, and pig, with reference to human embryo. Material fee, $24.
(Fall)

146 **Experimental Developmental Biology** (4) Mescher
Lecture (2 hours), laboratory (4 hours). Introduction to the experimental, biochemical, and genetic analysis of developing systems

through examination of the literature and laboratory experiments. Prerequisite: BiSc 145 or equivalent, or permission of instructor. Recommended: a course in cell biology or genetics and Chem 50 or 151–52. Laboratory fee, $24. (Spring)

148 Histology (4) Staff

Lecture (2 hours), laboratory (4 hours). Introduction to microscopical anatomy of normal tissues and organs with emphasis on the interrelationship of structure and function. Material fee, $24. (Fall and spring)

153 Survey of Neurobiology (4) Atkins

Lecture (3 hours), laboratory (2 hours). Study of the gross and cellular anatomy, physiology, and biochemistry of the nervous system, emphasis on mammals. Prerequisite: BiSc 104. Material fee, $24. (Fall)

155 Parasitology (4) Kates

Lecture (2 hours), laboratory (4 hours). Introduction to animal parasitology, survey of parasitic types from protozoa through arthropods. Material fee, $20. (Fall, even years)

156 Ichthyology (4) Collette

General biology of fishes, including structure, function, distribution and evolution, with emphasis on adaptations. Prerequisite: background in comparative anatomy and vertebrate zoology, or permission of instructor. (Spring)

157 Comparative Endocrinology (4) Staff

Lecture (3 hours), laboratory (2 hours). Comparative study of basic principles of chemical integration, neuro-endocrine relationships, and mechanisms of hormone action. Prerequisite: BiSc 104, 105 and or concurrent registration in Chem 151–52 or Chem 50. Material fee, $24. (Spring)

161 Entomology (4) Seifert

Lecture (2 hours), laboratory (4 hours). The biology of insects, including their morphology, physiology, development, behavior, and ecology. Material fee, $20. (Fall)

162 Insect Population and Evolutionary Biology (4) Seifert

Lecture (3 hours), laboratory (3 hours). Study of the interactions of insects with other organisms and the effects these interactions have on insect evolution. Insects as disease vectors and as pollinators, and mimetic systems will be discussed. Prerequisite: BiSc 108, 140, or 161, or permission of instructor. Material fee, $20. (Spring)

163 Human Physiology (3) Packer

Introduction to the function of organ systems of the human body. (Fall)

164 Human Physiology Laboratory (1) Packer

Study of basic physiology laboratory techniques; emphasis on the experimental study of homeostatic mechanisms in humans. Prerequisite or concurrent registration: BiSc 163. Material fee, $28. (Fall)

165 Vertebrate Physiology (4) Packer

Lecture (3 hours), laboratory (3 hours). Detailed study of selected organ systems, stressing chemical and physical bases. Prerequisite

BiSc 163 and 164, or equivalent. Prerequisite or concurrent registration: Chem 151–52 or 50. Material fee, $28. (Spring)

Third Group

204 **Seminar: Invertebrate Zoology** (3) Knowlton
Review of selected topics in physiology, development, and ecology of invertebrate animals, including reports on original publications. May be repeated for credit. (Fall)

*205 **Comparative Pathology** (3) Zook
An introduction to the study of disease and disease mechanisms in vertebrates, and comparison with disease in man. Recommended: courses in anatomy, histology, and physiology. (Fall)

211 **Adaptation and Natural Selection** (3) Seifert
An examination of special evolutionary problems and conflicts as well as peculiar adaptive characters of certain species. These include the evolutionary basis of sociality, sex, maleness and femaleness, and the conflict between individual and population survival. Prerequisite: BiSc 108 or permission of instructor. (Fall, odd years)

244 **Histophysiology** (3) Staff
Study of current publications in the field of histophysiology. (Fall)

252 **Seminar: Neurobiology** (3) Atkins
Study of current publications in comparative neurobiology. (Spring, even years)

253 **Evolution of the Nervous System** (4) Atkins
Invertebrate and vertebrate nervous systems. The development of increasing complexity in neurons and systems of neurons and the establishment of alternate pathways to accomplish particular functions. Lecture and laboratory. Prerequisite: BiSc 163. Material fee, $24. (Spring, odd years)

265 **Comparative Animal Physiology** (3) Packer
Survey of the physiological bases of adaptation of animals to diverse environments, emphasis on non-mammalian vertebrates. Prerequisite: BiSc 165 or equivalent. (Fall)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

BUSINESS ADMINISTRATION

Professors R.B. Eastin, E. Timbers, H.R. Page, F. Amling, C. Black, P.D. Cook, G.P. Lanter, J. Zwick, N.M. Loeser, A. El-Ansary, W.J. Keegan, E. Lurdetsky, S.F. Divita (*Chairman*)
Part-time Clinical Lecturers L.C. Collins, K.F. McClure, J.P. Murphy, S. Thurm, S.S. Katz, W.E. Elrod, Jr., F.E. McLaughlin

* Interdepartmental course offered by the Biological Sciences and Pathology Departments

Associate Professors R. Eldridge, S.N. Sherman, C.R. Miller, R.F. Dyer, W.C. Handorf, H.J. Davis, E.L. Hollander *(Visiting)*, P.B. Malone III *(Visiting)*
Associate Professorial Lecturers D.A. Peterson, R. L. Schweitzer
Assistant Professors J.M. Sachlis, J.J. Jones, T.M. Barnhill
Assistant Professorial Lecturers M.W. Hudgins, G.T. Solomon, C.C. Shepherd, J.P. Kelly, W.H. Frank
Instructor M.L. Slagle *(Visiting)*
Adjunct Instructors C.A. Allen, R.P. Hill

Programs of study in business administration leading to the degrees of *Bachelor of Business Administration*, *Master of Business Administration*, and *Doctor of Business Administration* are offered by the School of Government and Business Administration (see pages 131–61).

First Group

51 **Introduction to Business** (3) Davis, Page
Structure, activities, and problems of business enterprise; its contribution to the individual and to society; careers in business. (Fall and spring)

Second Group

101 **The Business Environment** (3) Slagle
Economic and legal environment of business enterprise; social and political influences; contemporary problems and issues. Restricted to seniors in the BBA program or with permission of instructor. (Fall and spring)

102 **Fundamentals of Management** (3) McCarthy, Davis
Planning, organizing, directing, coordinating, and controlling activities of the administrative unit; evolution of management thinking. (Fall and spring)

105 **Personnel Management** (3) Burdetsky, Malone
The labor force and labor markets. Industrial personnel and manpower programs, organization and policy in personnel activities. (Fall and spring)

106 **Leadership in Personnel Management** (3) Burdetsky
A study of the philosophy, principles, policies, and programs for effective personnel management and industrial relations as portrayed by case studies drawn from business and government. Prerequisite: BAd 105 or permission of instructor. (Fall)

107 **Collective Bargaining** (3) Burdetsky
American unionism and collective bargaining; economic, social, and public policy considerations. The negotiation and administration of collective bargaining agreements. Prerequisite: BAd 105 or permission of instructor. (Spring)

113 **Real Estate Investment** (3) Handorf, Barnhill
Principles of real estate investment including valuation, appraisal, financing, and development, in addition to a discussion of the mortgage market and its institutions. Prerequisite: BAd 131. (Fall)

121 Fundamentals of Insurance and Risk Management (3) Staff

Function of insurance and risk management in business enterprise. (Fall)

131 Business Finance (3) Barnhill, Handorf, Sarkiss

Analyzing capital requirements and methods of acquiring funds; planning efficient use of capital. Asset management; financial analysis, sources of funds, capital budgeting, stockholder relationships. Prerequisite: Acct 1–2, Econ 1, Math 30, 31, Stat 51. (Fall and spring)

132 International Business Finance (3) Eldridge, Hudgens

Analysis of the international economic environment and its influence on corporate financial management of international operations. (Fall and spring)

133 Capital Formation (3) Handorf

The process of capital formation in a free enterprise economy. Roles of business firms, financial intermediaries, money and capital market institutions, governmental regulatory agencies, fiscal and monetary policies. Prerequisite: BAd 131. (Spring)

138 Investment and Portfolio Management (3) Amling

Theory and principles of security analysis and portfolio management, including analysis of the national economy, industry, company, and security markets. Risk-reward and computer-aided analysis. Prerequisite: Acct 1–2, BAd 131. (Spring)

139 Advanced Financial Management (3) Barnhill, Handorf

Analysis and readings investigating the theoretical relationships underlying financial management. Emphasis is placed upon cases for decisions involving long-term assets, financings, dividend policy, and other special topics in finance. Prerequisite: BAd 131.

141 Basic Marketing Management (3) Allen, El-Ansary, Dyer, Hill

Role of marketing in the socioeconomic system, consumer behavior analysis, impact of consumerism. Major decision areas of product planning, pricing and distribution; tools of marketing research and demand analysis. Prerequisite: Econ 1–2, Stat 51. Laboratory fee, $15. (Fall and spring)

143 Marketing Research (3) Dyer, Jones

Basic methods and techniques of marketing research: problem definition, data collection, market survey and experimental design, data analysis and presentation. Special topics: attitude research, questionnaire construction and concept testing. Prerequisites: BAd 141, Stat 51, Mgt 118. Laboratory fee, $15. (Spring)

144 International Marketing Management (3) El-Ansary, Lauter, Keegan

Scope of international markets; factors in assessing world marketing opportunities; international marketing product, pricing, distribution, and promotion program development in dynamic world markets and global environment. Prerequisite: BAd 141. (Fall and spring)

145 Sales Management (3) Staff

Organization of sales department, sales planning and forecasting, quotas, territories, performance standards, and analysis and control of distribution costs. Prerequisite: BAd 141, 143, 146. (Fall)

146 Consumer Behavior (3) — Dyer, Jones

An examination of the social, cultural, and psychological factors influencing the behavior of consumers. Topics include models of buyer behavior, consumption patterns, market segmentation research, attitude formation and change, brand loyalty, the adoption of innovations, and store choice decisions. Marketing management and public policy implications of consumer research studies are stressed. Prerequisite: BAd 141 or permission of instructor. (Spring)

147 Advertising (3) — Thurm, Dyer

Planning an advertising campaign. Consumer and market information, message appeals, media selection and scheduling, measuring effectiveness. Current criticism and regulation of the advertising function. Other major marketing communication tools including personal selling and sales promotion, presented. Prerequisite: BAd 141, 143, 146. (Fall and spring)

148 Retailing Management Seminar (3) — El-Ansary, Allen

A study of retailing management and strategy covering the current environment of retailing, retail market and financial analysis, store location and design, inventory management, and non-store and service retailing. Industry executive and student presentations and case analyses. Prerequisite: BAd 131, 141, 146. (Spring)

161 Commercial Law (3) — Collins, McClure, Murphy

Fundamental concepts and principles of law encountered in business activity: contracts, bailments, agency, sales, negotiable instruments, bankruptcy, other topics. Basic legal considerations in business decision-making. (Fall and spring)

171 Transportation and Logistics Management (3) — Sherman

Systems and alternatives of the logistics manager; carrier, user, and public policy perspectives; urban and intercity mobility; cost, rate, competitive, and service problems; public financing and regulation of carrier enterprise; coordination of the modes of transportation. (Fall)

175 Introduction to International Business (3) — Grub, Hudgins

Social, cultural, political, legal and technological environment of multinational business, emphasizing host-government/multinational corporation interface. Terminology, trade uses and practices, conditions essential for successful business operations, including export and import procedures, documentation and legal requirements; physical movement of goods in international business. (Fall and spring)

176 International Business Theory and Policy (3) — Eldridge

Theoretical relationships underlying international business transactions, governmental and corporate policy, significant trends and their causes. (Spring)

178 International Business Policy and Operations (3) — Grub, Pieruccini

Integration of functional activities in international and multinational firms, through selected case studies and discussions, to develop and stimulate decision-making from an overall business policy standpoint. Prerequisites: BAd 175 and 1 advanced undergraduate standing. (Fall and spring)

181 **Manufacturing Production** (3) Hullander

Basic principles and methods of manufacturing production. Manufacturing facilities, plant and equipment. Illustrations selected from various process and fabrication industries. Prerequisite: Math 51, 52; Stat 51 or equivalent. (Fall and spring)

190 **Special Topics in Business Administration** (3) Staff

Experimental offering: new course topics and teaching methods.

198 **Business Policy and Administration** (3) Eastin, Loeser, Page

Integration of functional activities in arriving at overall business policy decisions. Prerequisite: BAd 102, 105, 131, 141, 181. (Fall and spring)

199 **Individual Research** (arr.)

Assigned topics. Admission by prior permission of advisor. May be repeated once for credit. (Fall and spring)

Third Group

201 **Social and Legal Environment of Business** (3) Staff

For designated students in the MBA program. Contemporary social forces acting on business management: business responsibility, ethics. Business under the U.S. Constitution, federal legislation, legal precedents and agency orders. Emphasis on court decisions relating to business. (Fall and spring)

202 **Business-Government Relations** (3) Staff

Regulatory and promotional activities of the government, independent regulatory agencies, antitrust activities, monetary and fiscal policy, regulation of labor management relations. (Fall and spring)

204 **Legal Aspects of International and Multinational Business** (3) Petersen

Legal environment of international and multinational business including legal systems, antitrust laws, regulation of direct investment, international arbitration and expropriation, topics of current interest. (Fall and spring)

205 **Business Representation and Lobbying** (3) Staff

Strategies, tactics, and techniques used by business in representing itself to the legislative and executive branches and regulatory agencies of the federal government. Legal and practical constraints. Ethical considerations. (Fall)

208 **Personnel Management and Industrial Relations** (3) Eastin, Loeser

Survey of personnel management practices and procedures including labor-management relations. (Fall and spring)

209 **Seminar: Personnel Management** (3) Eastin

Industrial personnel and manpower management, research in advanced problems. (Spring)

210 **The Personnel Manager** (3) Eastin

The personnel manager and his or her place in the organization, relation to other executives, policy role and relations with chief executive. Problems of the senior personnel executive. Prerequisite: BAd 208 or permission of instructor.

211 **Leadership and Executive Development** (3) Loeser

Theories of managerial leadership; issues and problems associated with leadership in large organizations and at higher management levels; executive selection and development. Prerequisite: Mgt 201 or permission of instructor. (Spring)

212 **Unionism and Collective Bargaining** (3) Burdetsky

The American labor movement. Collective bargaining and the conduct of labor relations under collective bargaining agreements. (Fall)

213 **Current Issues in Unionism, Collective Bargaining, and Labor Relations** (3) Burdetsky

Current problems and issues. Prerequisite: BAd 212. (Spring)

230 **Business Financial Management** Handorf, Sachlis

For designated students in the MBA program. Theory, policy, and practice in financial management; financial analysis, sources of funds, investing, capital planning, and budgeting. Prerequisites: Acct 201, Econ 211, Mgt 202 and 218, or equivalents. (Fall and spring)

231 **Financial Decision-making** (3) Handorf, Sachlis

Theory and practice of business finance with emphasis on special topics within valuation including capital budgeting, mergers, acquisitions, bankruptcy, and liquidation. Prerequisite: BAd 131 or 230. (Fall and spring)

233 **International Business Finance** (3) Zwick

Analysis of problems in international business finance. Impact of the evolving international payments system on business. Prerequisite: BAd 131 or equivalent. (Fall and spring)

234 **Seminar: Capital Formation** (3) Handorf

Determinants of saving and investment and resultant funds flow are evaluated. Special emphasis on the level and risk structure and term structure of interest rates. The role and management of financial institutions is stressed. Prerequisite: BAd 131 or 230. (Fall and spring)

235 **Financial Management** (3) Sachlis, Handorf, Amling

Cases in financial management: planning financial structure, obtaining and managing capital, issuing and placing securities, administering income, security arrangements. Prerequisite: BAd 231.

236 **Seminar: International Banking** Zwick

International financial intermediation and international banking. Functioning of international financial markets, public policy issues in international banking, regulation of multicountry banking institutions and the effect of international banks on national monetary policies. Prerequisites: BAd 233, 234. (Fall and spring)

237 **Investment Analysis** (3) Amling

Risk-reward analysis of security investments including analysis of national economy, industry, company, and market, introduction to portfolio management; emphasis on theory and computer methods. Prerequisite: BAd 131. Laboratory fee, $15. (Fall and spring)

238 **Seminar: Investment and Portfolio Management** (3) Sachlis, Amling

Portfolio management theory, application, and computer modeling.

Independent research on investment analysis and portfolio management with emphasis on theory, cases, and computer applications. **Prerequisite: BAd 237. Laboratory fee, $15.** **(Spring)**

239 Financial Theory (3) **Sachlis**

In-depth theoretical analysis of business financial topics, including asset management, financial structure, dividend policy and the capital asset pricing framework. Prerequisite: BAd 241, 237. (Fall and spring)

240 The Marketing Environment Dyer, El-Ansary, Jones

For designated students in the MBA program. The environment of marketing. The consumer orientation. Marketing policy and decisions. **Prerequisite: Econ 217 or 218. Laboratory fee, $15.** **(Fall and spring)**

241 Marketing Management (3) El-Ansary, Dyer, Divita

Marketing management problems: market segmentation, product planning, channels of distribution, advertising, personal selling, sales promotion, pricing and development of integrated marketing programs. **(Fall and spring)**

243 Seminar: Marketing Research (3) **Dyer**

Research as an aid to decision-making and increased efficiency in marketing, marketing research process, critical appraisal of methods and results, applications. **Laboratory fee, $15.**

245 Promotion Management/Marketing Communications (3) Dyer

Examination of promotion mix from a systems perspective supported by analytical methods and concepts regarding consumer attitudes and behavior. Topics: social context of promotion, role of communication in marketing, behavioral concepts and communications research, message design, economic and financial criteria, development of a promotion program. Prerequisite: BAd 241 or permission of instructor. **(Spring)**

246 Buyer Behavior (3) **Dyer**

Examination of theory and recent research concerning buyer decision processes. Interdisciplinary behavioral science studies on individual, family, and organizational purchase behavior are treated. Present and potential applications for marketing in the public and private sector are illustrated with cases. **Prerequisite: BAd 241 or permission of instructor.** **(Fall)**

247 Marketing and Public Policy (3) Divita, McLaughlin

Examination of principal areas of public policy formulation affecting marketing practice. Topics: advertising, warranties, product safety, health issues, consumer information systems, informal and formal redress mechanisms, business responsibilities. Government business and advocate viewpoints presented. Prerequisite: BAd 241, 245, or 246; **or permission of instructor.** **(Fall)**

248 International Marketing (3) Lauter, Keegan, El-Ansary

Identifying and assessing international marketing opportunities in a dynamic world environment; developing multinational marketing strategy; multinational marketing product, pricing, channels, and communication programs management; planning, organizing, controlling, and decision-making emphasized. (Fall and spring)

249 Marketing Strategy (3) — Divita

Analysis of complex marketing problems involving policy and operational decisions; emphasis on creative marketing strategy. Prerequisite: BAd 241, 245, and 246; or permission of instructor. (Spring)

250 Marketing to the Government (3) — Divita

Overview of government R&D and systems markets. Government acquisition process, buyer behavior, market research, technological planning and the bid decision, field sales force management, proposals, market strategy, pricing strategy, product-line strategy. (Fall)

253 Distribution Logistics (3) — El-Ansary

Problems of physical distribution and supply of goods. Role of logistics in the economy and the business firm, transportation rates and services, location theory and problems, service standards, inventory control, information flow, scheduling, allocation, warehousing, traffic and logistics system organization. (Fall)

255 Multinational Corporations in the World Economy (3) — Zwick, Grub

Business in the world economy; multinational corporations as economic, political, and social institutions; ownership and growth strategies; relationships to other nations; national and international controls; future of the multinational corporation. (Fall and spring)

256 Seminar: International Trade (3) — Eldridge

Classical and modern concepts of international trade theory; instruments and institutions of trade policy; barriers to trade; preferential treatment and trading blocs; trends and issues. (Fall and spring)

257 Business Policy in the Multinational Firm (3) — Grub

Integration of functional activities of multinational enterprises from an overall policy position, with emphasis on both domestic and international operations of the firm; problem-solving and decision-making in multinational companies; developing executives for international business. Prerequisite: advanced Master's standing. (Fall and spring)

258 External Development Financing (3) — Staff

Problems and alternative solutions for required capital formation and the financing of payment imbalances through external sources. Institutions and instruments for financing national development. Emphasis on planning as affected by energy policies, inflation, recession, changes in the international monetary system and revised attitudes among developed countries regarding bilateral and multilateral assistance. Prerequisite: BAd 235 or permission of instructor.

261 Applied Microeconomics (3) — Eldridge

Applications of economic theory and statistics to business decisions involving demand, production, cost, profits, investments, and investors. Prerequisite: Econ 217, Mgt 263, Stat 111, or equivalent, or permission of instructor. (Spring)

262 Applied Macroeconomics (3) — Black

Use of economic theory and statistics in business forecasting; interpretation of economic trends and developments; analysis

governmental economic policies. Prerequisite: Econ 218, Mgt 203, Stat 111; or equivalent; or permission of instructor. (Fall)

279 **Purchasing and Materials Management** (3) Page

Industrial purchasing and materials management principles and practices. Organization and functions in materials management. Determination of requirements, source selection, buying practices, policies, and ethics. (Fall)

280 **Procurement and Contracting** (3) Sherman

Principles and concepts essential to effecting large procurement programs. Planning, sourcing, and contractual design for diverse acquisitions. Emphasis on federal government policy with comparison of buying at other governmental levels and the private sector. (Fall and spring)

282 **Government Contract Administration** (3) Sherman

Surveillance and management of contract performance. Measurement of progress; specification interpretation; quality assurance; changes, negotiation, and adjustment; financial considerations; property; terminations; regulatory and policy concerns. Prerequisite: BAd 280 or permission of instructor. (Fall)

283 **Pricing and Negotiation** (3) Sherman

Scope and objectives of negotiated procurement; preparation, conduct, and recording of negotiations; analysis of cost, price, profit, investment, and risk; cost principles; incentives; relationship of contract type to work requirements; techniques of negotiation. Prerequisite: BAd 280 or permission of instructor. (Spring)

285 **Systems Procurement and Project Management** (3) Sherman

Major systems acquisition needs, objectives and organizational relationships. Design, establishment and execution of project management plans and procurement processes. Developing adequate intercontractual business relationships within the environment of public procurement. Management of projects under contract. (Spring)

290 **Special Topics in Business Administration** (3) Staff

Experimental offering; new course topics and teaching methods. May be repeated once for credit.

295 **Research Methods** (3) Black

Theory and practice in research methodology. Data sources and gathering, research models and designs, analysis and testing, controls, interpretation and presentation of findings. (Fall and spring)

296 **Business Decision Simulation** (3) Staff

Managerial decision making in a diversified firm in a simulated competitive environment in which a complex situation is played out using computers. Prerequisite: advanced master's or doctoral degree standing.

297 **Business Policy Formulation** (3) Loeser, Keegan, Page

Analysis of operational situations and policy issues. Developing and implementing solutions to managerial problems. Prerequisite: advanced master's degree standing. (Fall and spring)

298 **Directed Readings and Research in Business Administration** (3) Staff

Supervised readings or research in selected fields within business administration. Admission by prior permission of instructor. May be repeated once for credit. (Fall and spring)

299 **Thesis Seminar** (3) Staff

Examination of thesis standards, research philosophy and methodology. (Fall and spring)

300 **Thesis Research** (3) Staff

(Fall and spring)

Fourth Group

Fourth group courses are primarily for doctoral students. They are offered as the demand requires. They are open to other graduate students at the discretion of the Department.

302 **Seminar: Government-Business Relations** (3) Staff

Major current issues affecting government-business relations. Research and discussion on selected issues. Prerequisite: BAd 201, 202, 203; or permission of instructor.

311 12 **Seminar: Public-Private Sector Institutions and Relationships** (3–3) Chitwood

An analysis and critique of alternative theoretical frameworks for describing, understanding, and predicting the nature, values, and actions of American public and private institutions. Problems, potentials and alternatives for structuring public and private institutional arrangements to meet the needs of society.

331 **Seminar: Financial Markets** (3) Amling, Handorf, Sachlis

Recent readings in corporate financial theory, investment portfolio theory, and capital market theory. (May be repeated once for credit.) Prerequisite: BAd 232, 234, 238.

341 **Seminar: Marketing** (3) El-Ansary, Dyer

Examination of major theoretical developments in marketing. Topics include advances in research methods, models and data analysis. Emphasis on emerging concepts in consumer behavior, channels, marketing communication and marketing information systems.

358 **Colloquium on International Business** (3) Grub, Keegan, Zwick

Examination of selected topics in international business, with emphasis on major new theoretical and empirical developments. (Fall)

359 **Colloquium on Comparative Management** (3) Lauter

Comparative analysis of management systems under different economic, social and political conditions. Generic characteristics of management and how modified in different environments. Examination of selected literature.

365 **Seminar: Applied Economics** (3) Black

Primarily for doctoral students. Special topics and applications of analytical tools to business decision-making and policy. Prerequisite: BAd 261, 262; or permission of instructor.

381 **Seminar: Materials and Operations Management** (3) Page

Recent developments in manufacturing production and materials management, impact of technological, economic and social change; significant related trends. Private and public sector policy implications. New and emerging analysis techniques. Prerequisite: BAd 270, 280, or equivalent; or permission of instructor.

391 **Seminar: Business Management** Burdetsky, Eastin

Examination of major current issues, both theoretical and empirical, affecting the development of the business enterprise. Topics to be announced. Emphasis on policy and strategic issues affecting the total enterprise.

398 **Advanced Reading and Research** (arr.) Lauter

Limited to students preparing for the Doctor of Business Administration general examination. May be repeated for credit.

399 **Dissertation Research** (arr.) **Lauter**

Limited to Doctor of Business Administration candidates. May be repeated for credit.

CHEMISTRY

Professors R.E. Wood *(Chairman)*, T.P. Perros, W.E. Schmidt, D.G. White, **J.B. Levy, N. Filipescu, A.D. Britt, E.A. Caress**
Associate Professors D.A. Rowley, M. King, D. Ramaker

Bachelor of Arts or Bachelor of Science with a major in chemistry (departmental)—The department offers two undergraduate majors designed to give students broad training in the basic divisions of chemistry: analytical, inorganic, organic, and physical. *Major I* provides considerable concentration in chemistry. However, it permits a wider selection of electives and thus should meet the needs of students preparing to enter medicine, dentistry, or related fields. *Major II* is intended primarily for students preparing for graduate study in chemistry or those planning to enter the chemical profession and wishing to be certified to the American Chemical Society as having met the minimum requirements for professional training. Two foreign languages are recommended for students planning to do graduate work in chemistry.

The following requirements must be fulfilled:

1. Students in either Major I or Major II must meet the general requirements as stated on pages 72–73, 79–85. (Students should consult the departmental advisor regarding courses to be taken in satisfying the requirements for meaningful initiation into the humanities and social sciences.)

2. Prerequisite courses for Major I and Major II—Chem 11–12 and 22, or 15–16; Math 30, 31; Phys 1, 2.

3. [a] Required courses for Major I—BiSc 11–12 or Geol 21–22 (required of Bachelor of Science degree candidates only); Chem 111–12, 113–14, 122, 134, 141, 151–52, 153–54.

[b] Required courses for Major II—BiSc 11–12 or Geol 21–22 (required of Bachelor of Science degree candidates only); Chem 111–12, 113–14, 122, 141–42, 151–52, 153–54, 246, Math 32; one course selected from Chem 195, 207, 213, 221, 222, 251; Math 111, 139; Phys 161, 165, 175; Stat 197.

Twelve semester hours in French, German, Greek, Hebrew, Italian, Latin, Russian, or Spanish (students in Major II should elect German) are recommended for students in both Major I and Major II.

For graduation with Special Honors in chemistry, a student must register for Chem 195 at the beginning of the senior year. The decision to award Special Honors will be based on competence in research and general achievement in chemistry as evaluated by the faculty.

Master of Science in the field of chemistry—Prerequisite: a bachelor's degree with a major in chemistry from this University, or an equivalent degree.

Required: the general requirements, pages 88–96. The required 30 semester hours of graduate work must include Chem 213 and 221, and at least two of the following: Chem 207, 236, and 251. The thesis requirement, Chem 395–399, may be in analytical, inorganic, organic, or physical chemistry. Chem 156, or its equivalent, is prerequisite to research work in the field of organic chemistry. A reading knowledge examination in German or Russian must be passed, or proficiency in computer programming must be demonstrated. A student who intends to become a doctoral candidate is strongly urged to take Chem 207 as early as possible in the master's program.

Master of Science in the field of geochemistry (an interdepartmental degree offered by the Departments of Chemistry and Geology)—Prerequisite: a bachelor's degree with a major in chemistry or in geology from this University, or an equivalent degree.

Required: the general requirements, pages 88–96, including Chem 111–12, 213, and 299–399; and Geol 141, 241, and 242. The Master's Comprehensive Examination must be taken before registration for the second half of the thesis work. A reading knowledge examination in a foreign language, approved by the Department of Chemistry or Geology, must be passed prior to beginning the third semester of graduate work or before beginning the thesis work, whichever occurs first.

Doctor of Philosophy in the field of chemistry—Required: the general requirements, pages 88–91, 97–99. Chem 207, 213, 221, 235, 251, and 350 are normally required of the doctoral student, in addition to other courses as determined by consultation with the departmental program committee. A reading knowledge examination in German or Russian must be passed, and proficiency in computer programming must be demonstrated. Cumulative examinations replace the General Examination requirement.

Research fields: analytical chemistry, inorganic chemistry, organic chemistry, physical chemistry, electrochemistry, kinetics, magnetic resonance, theoretical, physical organic chemistry (reaction mechanisms), and structure and synthesis of natural products.

Ph.D. students in chemistry may substitute up to 12 hours of Dissertation Research (Chem 399) in the form of course work jointly approved by the Chemistry Department and the Graduate Program in Science, Technology, and Public Policy. The purpose of this option is to provide a useful background for chemistry doctoral students who may be employed in government agencies dealing with science, technology, and public policy programs. The 12 hours may be selected from the following courses: PSy 222, 223, 252, 268, 277; PAd 214, 260; Mgt 233, 234.

Doctor of Philosophy in the field of geochemistry (an interdepartmental degree offered by the Departments of Chemistry and Geology)—Required: the general requirements, pages 88–91, 97–99, including a reading knowledge examination in an approved foreign language plus the satisfactory completion of Geol 117 and 118 or 241 and the satisfactory completion of the General Examinations in four fields, including chemistry and geochemistry.

Bachelor of Arts in Education with a teaching field in chemistry—Prerequisite: the education curriculum, pages 111–12.

Required: the chemistry option and professional courses on pages 115–16.

Graduate Placement Examinations: All entering students in the master's and doctoral programs in the field of chemistry are required to take the American Chemical Society Graduate Level Placement Examinations, given by the department of chemistry, prior to registration in the Graduate School of Arts and Sciences. The four placement examinations (in the disciplines of analytical, organic, inorganic, and physical chemistry) are of the multiple-choice type. These tests are designed to cover the subject matter in the disciplines generally taught in modern undergraduate programs preparatory for graduate work in chemistry, and the results are used by the department to advise the individual student in planning a program of courses appropriate to the student's background.

Registration: Before completing registration each student must obtain from the representative of the department an assignment to lecture, recitation and laboratory sections. The work of the junior and senior years must be approved by the department.

All graduate students are required to participate in the seminar and colloquium programs.

PHYSICAL SCIENCE

First Group

3–4 Contemporary Science for Nonscience Majors (3–3) Filipescu

Lecture (2 hours), laboratory (3 hours). Contemporary topics in physical, biological and medical science. Chem 3 is not prerequisite to Chem 4 but both courses must be successfully completed to fulfill the meaningful initiation requirement. Laboratory fee, $20 per semester. (Academic year)

CHEMISTRY

First Group

11–12 General Chemistry (4–4) Perros

Lecture (3 hours), laboratory (3 hours), recitation (1 hour). Elementary course in general chemistry including qualitative analysis. Prerequisite to Chem 11: one year of high school algebra. Prerequisite to Chem 12: Chem 11. Laboratory fee, $28 per semester. (Chem 11 and 12—fall and spring)

13 General Chemistry (4) Britt

For engineering and applied science students only. Lecture (3 hours), laboratory (3 hours), recitation (1 hour). Atomic structure, chemical bonding, chemical equations, acids and bases, chemical equilibrium, liquid and solid states, periodicity, electrochemistry, organic chemistry. Prerequisite: Math 31, Phys 14 or 15. Laboratory fee, $28. (Fall)

15–16 Intensive General and Analytical Chemistry (3–4) Britt

(Honors Course)

Chem 15: Lecture (3 hours), laboratory (3 hours), recitation (1 hour).
Chem 16: Lecture (2 hours), laboratory (6 hours), recitation (1 hour).

Equivalent to Chem 11–12 and 22, but with selected topics studied in depth. Prerequisite to Chem 10: high school physics and chemistry. Prerequisite to Chem 16: Chem 15. Admission by placement test prior to registration or on basis of College Board Advanced Placement Examination. Laboratory fee, $28 per semester. (Academic year)

22 **Introductory Quantitative Analysis** (4) Staff

Lecture (2 hours); laboratory (6 hours). Theory and practice of quantitative analysis by classical methods; introduction to instrumental analysis. Prerequisite: Chem 12. Laboratory fee, $28. (Fall and spring)

50 **Introduction to Organic Chemistry** (4) Caress

Lecture (3 hours); laboratory (3 hours). A terminal course for students in related disciplines. This course does not fulfill the organic chemistry requirement for chemistry majors or premedical students. Prerequisite: Chem 12 or 16. Laboratory fee, $28. (Spring)

Second Group

110 **Introduction to Physical Chemistry** (3) Wood

Topics include chemical thermodynamics, chemical kinetics, electrochemistry, solution chemistry, membrane and phase equilibria, and others. Prerequisite: Chem 16 or 22, Math 31, Phys 2; or permission of instructor. Not open to chemistry majors. May not be taken for credit by students who have received credit for Chem 111–12 or an equivalent course. (Summer)

111–12 **Physical Chemistry** (3–3) Wood, Ramaker

Gas laws, chemical thermodynamics, chemical equilibrium, kinetics, quantum chemistry, atomic and molecular spectra, structure of solids, liquids, and macromolecules. Prerequisite to Chem 111: Chem 16 or 22; Math 31; Phys 2. Prerequisite to Chem 112: Chem 111. (Academic year)

113 **Physical Chemistry Laboratory** (2) Schmidt, Wood

Laboratory complement to Chem 111. Prerequisite or concurrent registration: Chem 111. Laboratory fee, $28. (Fall)

114 **Instrumental Analysis Laboratory** (2) Schmidt, Ramaker

Laboratory complement to Chem 112 and 122. Prerequisite or concurrent registration: Chem 112, 113, and 122. Laboratory fee, $28. (Spring)

122 **Instrumental Analysis Lectures** (2) Schmidt

Theory of instrumental methods in qualitative and quantitative analysis, determination of structure, and study of reaction mechanisms with emphasis on electroanalysis, spectrophotometry, and chromatography. Correlated with Chem 114. Prerequisite or concurrent registration: Chem 112. (Spring)

134 **Descriptive Inorganic Chemistry** (2) Perros

Intermediate-level course emphasizing the descriptive chemistry of the elements. Prerequisite: Chem 16 or 22, 152. Prerequisite or concurrent registration: Chem 111. (Fall)

141–42 **Advanced Experimental Chemistry** (2–2) White, Caress

Designed to provide the chemistry major with facility in experimental methods common to all disciplines of chemistry. Prerequisite

Chem 154. Prerequisite or concurrent registration: Chem 111. Laboratory fee, $28 a semester. [Academic year]

151–52 Organic Chemistry (3–3) — Levy, King

Chemistry of the compounds of carbon. Prerequisite to Chem 151: Chem 12 or 16. Prerequisite to Chem 152: Chem 151. [Academic year]

153–54 Organic Chemistry Laboratory (1–1) — Staff

Laboratory complement of Chem 151–52. Prerequisite or concurrent registration: Chem 151–52. Prerequisite to Chem 154: Chem 153. Laboratory fee, $28 a semester. [Academic year]

156 Qualitative Organic Analysis (3) — King

Lecture (1 hour), laboratory (6 hours). Separation of mixtures such as essential oils, peptides, commercial pharmaceuticals, carbohydrates, and of others as appropriate; identification of their components using spectroscopic techniques. Lecture emphasizes the practical considerations in separation methods (including GLPC, TLC, and HPLC) and the spectral interpretation of unknown substances. Prerequisite: Chem 16 or 22. Laboratory fee, $28. [Spring, even years]

191 History of Chemistry (2) — Perros

Historical development of chemistry from antiquity to the 20th century. Prerequisite: Chem 12 or 16. [Fall, odd years]

195 Undergraduate Research (1 or 2) — Staff

Research on problems approved by the staff. Approval must be obtained prior to registration. May be repeated once for credit. Laboratory fee, $14 per semester hour. [Fall and spring]

Third Group

207 Chemical Bonding (3) — Ramaker

Quantum mechanics, approximate methods, electron spin, Pauli principle, atomic and molecular structure. Prerequisite: Chem 112. [Fall]

211–12 Physical Chemistry (2–1) — Wood, Ramaker

Same as Chem 111–12. Admission only by departmental permission. Credit awarded upon satisfactory completion of Chem 213. [Academic year]

213 Chemical Thermodynamics (3) — Wood

Application of thermodynamics to chemical problems. Thermochemistry, homogeneous and heterogeneous equilibria, statistical calculation of thermodynamic properties, electrochemistry. Prerequisite: Chem 112 or 212. [Spring]

216 Statistical Mechanics (3) — Ramaker

Introduction to classical and quantum statistics designed to acquaint students with basic principles and methods. Prerequisite or concurrent registration: Chem 207 or permission of instructor. [Offered as the demand requires]

218 Molecular Spectroscopy (3) — Ramaker

Applications of quantum chemistry, molecular orbital theory, valence bond theory, vibration and rotation of molecules, IR and electronic spectroscopy. Prerequisite: Chem 207. [Spring, even years]

221 **Advanced Analytical Chemistry I** (3) Britt

Theory and application of recent spectrometric methods of analysis including electrical, magnetic, and optical instrumentation. Prerequisite: Chem 122. (Fall)

222 **Advanced Analytical Chemistry II** (2 or 3) Schmidt

Lecture (2 hours); laboratory (3 hours—optional). Theory and application of electroanalysis and separations by physiochemical methods. Prerequisite: Chem 122. Laboratory fee, $14. (Spring, even years)

233 **Organometallic Chemistry** (3) White

Survey of organometallic compounds with emphasis on the compounds of lithium, boron, aluminum, silicon, the transition metals and the catalytic role of certain organotransition metal complexes. Prerequisite: Chem 235 and 251, or permission of instructor. (Spring, even years)

235–36 **Advanced Inorganic Chemistry** (3–3) Rowley

Application of modern chemical theories to inorganic substances and reactions followed by a detailed study, developed from the periodic table, of the chemistry of the more common elements. Prerequisite to Chem 235: Chem 112, 152. Prerequisite to Chem 236: Chem 235. (Academic year)

251–52 **Advanced Organic Chemistry** (3–3) Filipescu

Synthesis, reactions, and properties of organic compounds; fundamental theories of organic chemistry, emphasis on reaction mechanisms. Prerequisite to Chem 251: Chem 112, 152. Prerequisite to Chem 252: Chem 251. (Academic year)

257 **Physical-Organic Chemistry** (3) Levy

The transition state theory of chemical kinetics, applications to reaction mechanisms, kinetic isotope effects, linear-free energy relationships, concentrated and "super" acids, Woodward-Hoffman rules, free radical reactions. Prerequisite: Chem 252 or permission of instructor. (Fall, odd years)

258 **Synthesis and Structure Determination in Organic Chemistry** (3) Caress

Methods of structure determination and synthesis of complex organic molecules. Prerequisite: Chem 251 or permission of instructor. (Fall, even years)

259 **Polymer Chemistry** (3) Barkin

A study of the preparation, properties, and structure of macromolecules. Prerequisite: Chemistry 152 and 111 or permission of instructor. (Fall)

295 **Research** (arr.) Staff

Research on problems approved by the staff. Open to qualified students with advanced training. May be repeated for credit not to exceed a total of 8 semester hours. Laboratory fee, $14 a semester hour. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff

(Fall and spring)



Fourth Group

350 **Choice and Design of a Research Problem** (1) Staff

Development in written form of an original research plan, tentatively approved, and its oral defense. If a grade of C or lower, the student must repeat this course for credit and must develop a new research plan. (Fall and spring)

398 **Advanced Reading and Research** (arr.) Staff

Limited to students preparing for the Doctor of Philosophy cumulative examinations. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff

Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

CHINESE

See **East Asian Languages and Literatures.**

CLASSICS

Associate Professor J.E. Ziolkowski *(Chairman)*
Associate Professorial Lecturer M.E. Norton
Adjunct Assistant Professor E.A. Fisher
Assistant Professorial Lecturer Y.M. Moses
Special Lecturer M.D. Ticktin

Bachelor of Arts with a major in classical humanities (departmental).—The following requirements must be fulfilled:

1. The general requirements as stated on pages 72–73 79–85.
2. Prerequisite courses—Clas 1–2, 3, 4; or equivalent: or Clas 11–12, 13–14; or equivalent; and Clas 71, 72. Students may substitute for Clas 3, 4, or 13–14 two additional courses (6 semester hours) consisting of Clas 64 and a course to be selected in consultation with the departmental advisor.
3. Required courses in the major—(a) 12 semester hours selected from second group classics courses; (b) 18 semester hours selected from Art 101, 102, 203, 111; Hist 105, 107, 108, 109, 110, 111; Phil 111; PSc 105; Rel 144.

Bachelor of Arts with a major in classical archaeology and classics (departmental).—An interdepartmental major arranged in conjunction with the Department of Art. The following requirements must be fulfilled:

1. The general requirements as stated on pages 72–73, 79–85. [Students should consult the departmental advisor regarding courses to be taken in satisfying the requirement for meaningful initiation into the natural and mathematical sciences.]
2. Prerequisite courses—Clas 1–2, 3, 4; or Clas 11–12, 13–14
3. Required courses in the major—Art 101, 102, 103, 111; Hist 109, 110; 15 semester hours in second-group courses in Greek or Latin including Clas 138. A reading knowledge of French and German is recommended.]

Master of Arts in the field of classical archaeology, classics, and history (an interdepartmental degree program offered by the Departments of Art, Classics, and History).—Prerequisite: a bachelor's degree with a background in classical studies and either Greek or Latin. Applicants from other institutions must

present scores on the Graduate Record Examination to the Office of the Graduate School of Arts and Sciences.

Required: the general requirements, pages 86-96. The program of study consists of 24 semester hours of course work (as many as possible should be third-group courses) selected in consultation with the appropriate advisor from the departments of art, classics and history, plus a thesis (equivalent to six additional semester hours). Candidates must pass a reading knowledge examination in French or German. All candidates are required to pass a general Master's Comprehensive Examination.

COURSES IN GREEK, HEBREW, AND LATIN

First Group

1–2 Beginning Latin (3–3) Ziolkowski
Grammatical essentials of the language, appropriate reading selections, development of English derivatives, introduction to Roman life and literature. (Academic year)

3 Intermediate Latin: Prose and Poetry (3) Norton
Development of ability to read and understand Latin literature of moderate difficulty. Prerequisite: Clas 1-2 or equivalent. (Fall)

4 Vergil's Aeneid (3) Norton
Significant passages of Vergil's famous epic in Latin; reading and discussion of the entire poem in translation. Prerequisite: Clas 3 or permission of instructor. (Spring)

11–12 Beginning Greek: Classical (3–3) Fisher
Study of the grammar, vocabulary, and structure of Greek. Reading of selected classical authors. (Academic year)

13–14 Intermediate Greek: Classical (3–3) Staff
Review of grammar; extensive reading of prose and poetry; e.g., Homer, Herodotus, or a play. (Academic year)

21–22 Beginning Hebrew (3–3) Moses
Grammatical essentials of the language; readings selected from classical and modern texts; basic audio-lingual drills for comprehension and expression. Laboratory fee, $17.50 per semester. (Academic year)

23–24 Intermediate Hebrew (3–3) Ticktin
Intensive readings and text analysis, with opportunities to develop basic skills. Materials range from Israeli newspapers and scholarly journals to liturgical poetry and rabbinic narratives. Laboratory fee, $17.50 per semester. (Academic year)

Second Group

103 Modern Hebrew Nonfiction (3) Ticktin
Directed readings in humanities and social sciences. Development of linguistic skills necessary for independent research. (Fall)

104 Modern Hebrew Fiction (3) Ticktin
Study of selected modern Israeli short stories and poems. (Spring)

109–10 **Major Latin Authors** (3–3) Ziolkowski
Selections from one or two major authors will be read each semester. May be repeated for credit. Prerequisite: Clas 3–4 or permission of instructor. (Academic year)

131–32 **Latin Prose Composition** (1–1) Ziolkowski
Exercises in Latin prose composition for all students who have had at least one year of college Latin.

134 **Medieval Latin** (3) Andrews
Selections from the Vulgate and representative Latin writers through the 11th century. Prerequisite: Clas 3, 4; or permission of instructor. May be taken for graduate credit with approval of instructor. (Spring)

139–40 **Major Greek Authors** (3–3) Staff
Selections from a wide variety of Greek prose, drama, and poetry, suited to the needs of the class. May be repeated for credit with permission of instructor. Prerequisite: Clas 14. (Academic year)

141–42 **Greek Prose Composition** (1–1) Staff
Exercise in Greek prose composition. Prerequisite: Clas 12 and permission of instructor. (Academic year)

185–86 **Directed Reading** (1, 2, or 3) Staff
Reading of material in the student's field of interest. Admission by permission of instructor. May be taken for graduate credit.

Third Group

201 **Greek Epigraphy** (3) Fisher
Readings in Greek epigraphical texts. May be repeated for credit with permission of instructor. Prerequisite: at least two years of college Greek. (Fall)

COURSES IN ENGLISH TRANSLATION

First Group

64 **Greek and Latin Origins of English Words** (3) Fisher
Study of Greek and Latin elements in English to improve vocabulary and facilitate understanding of the language of science, philosophy, politics, etc.

71 **Greek Civilization** (3) Fisher
Study of ancient Greek civilization with focus on public and private life as seen primarily through literature. (Fall)

72 **Roman Civilization** (3) Ziolkowski
Study of Roman civilization with focus on public and private life as seen primarily through literature. (Spring)

Second Group

101 **Israeli Society and Culture: Literary Perspectives** (3) Tucktin
A study of literature reflecting such contemporary issues as the conflict between the "builder's generation" and their children, the

cultural contexts of Ashkenazim and Sefardim. Issues of the Arab impact of the Holocaust, Zionist ideals and current realities. (Fall)

102 **Contemporary Israeli Short Stories and Poetry** (3) Tickton
An introduction to post-1948 writers, including A. B. Yehoshua, Amo Oz, Dovaf Shalon, Marion Aptzifeld, Dalfia Ravikovitch, Yehuda Amichai, Haim Gury, Amir Gilboa, and Amalia Kahana Karmon. (Spring)

105 **Special Topics in Classical Literature** (3) Staff
Focus on a selected topic, such as death in classical antiquity or the hero, or on study of a genre, such as satire or oratory. May be repeated for credit

108 **Classical Mythology** (3) Norton
Mythology of the Greeks and Romans from the creation of the world, tales of the gods, heroes, and great families that have influenced literature, art, and music. (Fall)

113 **Greek and Roman Drama** (3) Staff
Selected masterpieces of Greek and Roman tragedy and comedy. (Spring)

127 **Classical Influence on Western Civilization** (3) Ziolkowski
A survey of Greek and Roman influence on Western civilization relevant to modern America: literature, art, law, science, philosophy, etc. (Fall)

138 **Seminar: Classical Studies** (3) Staff
Survey of the broad range of sources and resources involved in pursuing classical studies: standard references, periodicals, library holdings, papyrology, textual criticism, history of classical scholarship

170 **Women in Classical Antiquity** (3) Norton
In-depth study and discussion of readings from ancient and modern sources on the role of women in Greek and Roman society.

CRIMINAL JUSTICE

See **Forensic Sciences.**

DRAMA

See **Speech and Drama.**

EARLY MODERN EUROPEAN STUDIES

Committee on Early Modern European Studies

R.E. Kennedy (Chairman), F.S. Grubar, C.A. Linden, G.E. Mazzeo, J.P. Reesing, Jr., R.H. Schlagel, K. Thoenelt, D. Wallace

The Columbian College of Arts and Sciences offers an interdisciplinary program in Early Modern European Studies. This humanities program is designed

to enhance the student's understanding of the history, philosophy, religion, sciences, literature and arts of the five centuries (1500–1900) during which the Western World began to take on its modern dimensions. The program is directed by an interdepartmental committee.

Bachelor of Arts with a major in Early Modern European Studies—The following requirements must be fulfilled:

1. The general requirements as stated on pages 72–73, 79–85.
2. Requirements for the major:
   a. Six semester hours of third year level French, German, or Spanish literature courses taught in the language, from among the following: Fren 120, 121–22, 123–24; Ger 103–4, 111–12, 131–32; Span 121–22, 123–24, 125
   b. Phil 112
   c. Rel 145
   d. PSc 106
   e. Twenty-seven semester hours of art history, history, and English literature, with the course distribution to be determined in consultation with the program advisor, and with a minimum of 6 hours from each of the following: Art 104–5, 106–7, 108, 113–14, 121–22; Engl 125–26, 127–28, 129, 130, 131–32; Hist 101, 105, 121–22, 123, 141, 148, 151, 153, 154

EAST ASIAN LANGUAGES AND LITERATURES

Professor C.W. Shih *(Chairman)*
Associate Professorial Lecturers T. Lawton, M.J. Evans
Assistant Professors G.C.Y. Wang, D.L. Lee
Lecturers M. Wang, W.P. Lyle, N.K. Williams

Bachelor of Arts with a major in Chinese Language and Literature—The requirements are as follows:

1. The general requirements as stated on pages 72–73, 77, 79–85, and 168. (Sixty semester hours from Columbian College, or the equivalent from another accredited institution are required.)
2. Prerequisite courses—Chin 5–6 (preferred); or Chin 1–2, 3–4, and 9, or Chin 7–8 and 9.
3. Required for the major:

(a) *Departmental major in the School of Public and International Affairs*—Chin 11–12, 109–10, and 163–64; plus 12 additional semester hours of second-group Chinese literature courses. The student is required to pass a major examination at the end of the senior year. The coordinated field of knowledge upon which the student will be examined includes an active command of modern Chinese language and a general knowledge of Chinese literature and culture. A proseminar (Chin 199–200) assists the student in preparation for the major examination.

(b) *Field-of-Study major in Columbian College of Arts and Sciences*—Completion of Chin 11–12, 109–10, 163–64, and the passing of the major examination at the end of the senior year. The coordinated field of knowledge upon which the student will be examined includes an active command of modern Chinese language and a general knowledge of Chinese literature and culture. A proseminar (Chin 199–200) assists the student in preparation for the major examination.

Bachelor of Arts with a major in East Asian Studies (China or Japan)—See pages 72–73, 77–78, and 168

A Junior Year Abroad Program is available

Master of Arts in East Asian Studies with a concentration in Chinese Language and Literature. The requirements are as follows:

1. The general requirements as stated on pages 171–75.
2. Prerequisite: 24 semester hours of Chinese language.
3. 12 semester hours of Chinese literature, 6 hours of history, and 6 hours of relevant East Asian courses.
4. 6 semester hours of thesis research.

CHINESE

First Group

*1–2 **Beginning Mandarin Chinese, Level I** (3–3) Staff

Classroom (3 hours), laboratory (1 hour). Fundamentals of grammar and pronunciation with graded reading and practice in writing. Prerequisite to Chin 2: Chin 1. Laboratory fee, $17.50 per semester. (Academic year)

*3–4 **Beginning Mandarin Chinese, Level II** (3–3) G. Wang

Classroom (3 hours), laboratory (1 hour). Continuation of grammar and spoken Chinese with more emphasis on the written language and reading. Prerequisite to Chin 3: Chin 2 or equivalent. Prerequisite to Chin 4: Chin 3. Laboratory fee, $17.50 per semester. (Academic year)

5–6 **Beginning Intensive Mandarin Chinese, Levels I-II** (8–8) Lee

Intensive beginner's course in fundamentals of grammar and pronunciation with graded reading and practice in writing. Prerequisite to Chin 6: Chin 5. Laboratory fee, $17.50 per semester. (Academic year)

*7–8 **Beginning Intensive Mandarin Chinese** (6–6) Lee, Wang

Intensive beginner's course in fundamentals of grammar and pronunciation with graded reading and practice in writing. Prerequisite to Chin 8: Chin 7. Laboratory fee, $17.50 per session. (Summer)

*9 **Beginning Mandarin Chinese, Level II** (4) Lee

Reading of simple modern expository writings. Analysis of syntactic structure and practice in writing. Prerequisite: Chin 4 or 8. Laboratory fee, $17.50. (Fall or spring)

10 **Chinese Calligraphy** (1) M. Wang

Design and writing of Chinese characters with traditional writing implements. No knowledge of the language required. May be repeated for credit. (Fall and spring)

11–12 **Intermediate Intensive Mandarin Chinese** (6–6) G. Wang

Reading of basic texts, writing of short pieces, conversation, systematic review of grammar. Prerequisite to Chin 11: Chin 6 or 9. Prerequisite to Chin 12: Chin 11. Laboratory fee, $17.50 per semester. (Academic year)

13–14 **Reading Chinese for Beginners** (4–4) Staff

Basic grammar and syntax of modern Chinese; development of reading ability in beginners' textbooks and newspapers. Primarily for

* The combination of Chin 1, 3–4, and 9, or the combination of Chin 2, 3–4, and 9, is equivalent to Chin 5–6.

graduate students who wish to acquire a reading knowledge without learning to speak or write the language. (Academic year)

*91 **East Asia—Past and Present** (3) Johnson and Associated Faculty

An interdisciplinary course, introducing the student to a comprehensive and integrated understanding of the civilization and present problems of East Asia. (Spring)

93–94 **East Asian Literature—in Translation** (3–3) Staff

Lecture and discussion. Survey of Chinese and Japanese literature, from earliest periods through literary masterpieces of the early 20th century. (Academic year)

Second Group

107–8 **Readings in Modern Chinese** (3–3) Staff

Intensive readings in selected modern literary works, social science materials, and documentary materials. Prerequisite: Chin 12 or equivalent. (Academic year)

109–10 **Introduction to Classical Chinese** (3–3) Shih

Introduction to classical writing in Chinese literature, history, and philosophy. Prerequisite: Chin 6 or 9. (Academic year)

123–24 **Introduction to Chinese Linguistics** (3–3) Lee

Introduction to the history of the Chinese language. Analysis of linguistic structure of modern spoken Chinese and classical Chinese. Prerequisite: Chin 6 or equivalent, or a course in linguistics. (Academic year)

161–62 **Introduction to Chinese Culture** (3–3) Staff

Survey of the Chinese cultural heritage—literature, philosophy, art, religion, and social history—from pre-history to the modern era. Lecture and discussion in English. (Academic year)

163–64 **Chinese Literature in Translation** (3–3) Evans

An introductory course focusing on major works of poetry, drama, and the novel in their historical and social context. (Academic year)

179–80 **20th-Century Chinese Literature** (3–3) Shih

Short stories of Lu Hsün, Lao She, and others. Informal essays by Lu Hsün, Chou Tso-jen, and Chu Tze-ch'ing. Drama of T'ien Han and Ts'ao Yü. Prerequisite: Chin 107 or equivalent. (Academic year)

185–86 **Directed Reading** (3–3) Staff

Reading of material in the student's field of interest. Admission by permission of instructor. (Academic year)

199–200 **Proseminar: Readings for the Major in Chinese Language and Literature** (3–3) Staff

Conferences and group discussions. (Academic year)

---

* An interdepartmental course offered by the East Asian Languages and Literatures, Geography and Regional Science, History, Philosophy, Political Science, and Religion Departments.

Third Group

271–72 **Poetry of the T'ang and Sung Periods** (3–3) Staff
Reading of works of leading poets. Discussion of content and style. **Prerequisite: Chin 109 or equivalent.** (Academic year)

273 **Yüan Drama** (3) Shih
Readings of plays by Kuan Han ch'ing, Ma Chih-Yüan, Cheng Kuang-tsu, Po P'u, and Wang Shih-fu. **Prerequisite: Chin 109 or equivalent.**

277–78 **Prose Narratives of the Sung, Ming, and Ch'ing Periods** (3–3) Shih
Short stories of the Sung period. Selected readings of Ming-Ch'ing novels. Historical development and stylistic traits. **Prerequisite: Chin 107 or equivalent.** (Academic year)

JAPANESE

First Group

1–2 **Beginning Japanese, Level I** (4–4) Williams
Lecture (4 hours), laboratory (1 hour). Fundamentals of grammar and pronunciation with graded reading and practice in writing. **Prerequisite to Japn 2: Japn 1. Laboratory fee, $17.50 per semester.** (Academic year)

3–4 **Beginning Japanese, Level II** (4–4) Williams
Lecture (4 hours), laboratory (1 hour). Continuation of grammar with more emphasis on written language and reading. **Prerequisite to Japn 3: Japn 2. Prerequisite to Japn 4: Japn 3. Laboratory fee, $17.50 per semester.** (Academic year)

ECONOMICS

Professors J.W. Kendrick, C.T. Stewart, Jr. (Chairman), J. Aschheim, R.P. Sharkey, H. Solomon, S. Levitan, T. Szanyi-Unger, Jr. (Research), C.Y. Hatch, J.L. Castwirth, M.A. Holman, R.M. Dunn, Jr., W.F.E. Long, S.F. Haber
Adjunct Professors T.F. Carroll, J. Grunwald, J.L. Fisher, P. Swamy
Professorial Lecturers J. Hardt, E.M. Hadley, O.C. Snellingen, J. Kraft, T.D. Simpson
Associate Professors R.Y. Yin, R.S. Goldfarb, J.R. Barth, A.M. Yezer, O. Havrylyshyn, R.M. Scheffler
Associate Professorial Lecturers P.A. Musgrove, S.S. Sutton, S.C. Salop, D.G. Tuerck, G.R. Wilensky, J.E. Fredland, R.B. Helms, S.W. Salant, T.R. Robinson, J. Salop, R.E. French, S.E. McGaughey
Assistant Professors R. Snies, C.M. Aho, J.J. Cordes, S. Nefci, R.C. Sickles, A.D. Strickland, M.R. Metzger, D. Lindauer (Visiting)
Assistant Professorial Lecturers I. Kyrtakopoulos, J. Muskin

Bachelor of Arts with a major in economics (departmental)—**The following requirements must be fulfilled:**

1. The general requirements as stated on pages 72, 73, 79–85. (Students should consult the departmental adviser regarding courses to be taken in satisfying the requirement for meaningful initiation into the humanities and the natural and mathematical sciences.)

2. Prerequisite course—Econ 1-2.

3. Required courses in related areas—Math 41 and 42, or equivalent; Stat 111 and 112, or equivalent; six semester hours of a social science other than economics.

4. Required courses in the major—Econ 101, 102, 121, 198, and 15 additional semester hours of second-group economics courses to be approved by the departmental advisor.

Master of Arts in the field of economics—Prerequisite, a Bachelor of Arts degree with a major in economics from this University, or an equivalent degree. An understanding of basic calculus is assumed for those entering the Master of Arts program in economics.

Required: the general requirements, pages 88-96, including (1) Econ 203-4, 265, and 275 or 279; (2) 12 additional semester hours to be selected from other third-group economics courses; (3) a Master's Comprehensive Examination in economic theory; (4) completion of a tool requirement (either the passing of a reading knowledge examination in one foreign language or the satisfactory completion of one of the following courses: Math 124, Stat 97, or Stat 157-58); and (5) either a thesis (Econ 299-300) or 12 semester hours selected from additional third-group economics courses.

Doctor of Philosophy in the field of economics—Required: the general requirements, pages 88-91, 97-99, including (1) Econ 202, 203-4, 265-6, 215-16, 379 or 380, and 24 additional semester hours of approved graduate course work including Econ 275 or 279; (2) passing of the General Examination in microeconomic theory, macroeconomic theory, and two other fields selected by the student and approved by the doctoral program committee; (3) completion of the tool requirement: the passing of a reading knowledge examination in one foreign language, plus the satisfactory completion of Math 124, Stat 197, or Stat 157-58 (a minimum of six semester hours in approved graduate course work, completed with a grade of *B* or above, in a department other than Economics, is permitted as a substitution for the language reading examination); and (4) a dissertation to demonstrate the candidate's ability to do original research in one of the following fields: econometrics development, economic history, economic policy, economic theory, environmental economics, health economics, history of economic thought, industrial organization, international economics, labor economics, mathematical economics, monetary economics, national income accounting, natural resources economics, public finance, regional and urban economics, and Soviet economics.

Examinations: the general comprehensive examinations are given in January, May, and September. Microeconomic and macroeconomic theory examinations should be taken first. They must be passed (as defined in the following sentence) within six months of (a) the completion of 36 graduate credit hours toward the degree and (b) two years spent in the program, the time limit beginning when both (a) and (b) have been accomplished. Students must earn a grade of "satisfactory pass" or better on either the microeconomic or macroeconomic theory examination and at least a "bare pass" in the other examination, in order to be viewed as having passed both examinations. These examinations may be taken a second time with the approval of the Department and the dean. No further opportunity to take the examinations is permitted. Students should consult with the professors responsible for their fields and notify the Department two months in advance of their intention to take the examinations. If such notification is not given sufficiently in advance, it may not be possible to sit for the examination. These examination requirements will apply in full to all students entering the Ph.D. economics degree program in the Fall semester, 1979.

Admission to the second unit, or dissertation research stage, will be considered upon satisfactory completion of four comprehensive examinations and

the two tool requirements for the Ph.D. degree. A maximum of two bare passes on the comprehensive examinations is permitted for admission to the dissertation research stage. All comprehensive examinations required for the degree plus the required tools must be passed within five years after entry into the program. Students who fail to meet these requirements will be excused from the degree program.

Departmental prerequisite: Econ 1–2 is prerequisite to all other courses in economics except Econ 217–18

First Group

1–2 Principles of Economics (3–3) Hsieh, Long, Dunn
Lecture (2 hours), discussion (1 hour). Survey of the major economic principles, institutions, and problems in contemporary life. Econ 1: macroeconomics; Econ 2: microeconomics. (Econ 1 and 2—fall and spring)

*91 **East Asia—Past and Present** (3) Johnson and Associated Faculty
An interdisciplinary course, introducing the student to a comprehensive and integrated understanding of the civilization and present problems of East Asia.

Second Group

101 **Intermediate Microeconomic Theory** (3) Yin, Metzger, Strickland
Analysis of supply, demand, and pricing. (Fall and spring)

102 **Intermediate Macroeconomic Theory** (3) Kendrick, Yin
Theories of national income determination and growth. (Fall and spring)

104 **History of Economic Thought** (3) Hsieh
History of the major schools of economic thought, influence of changing problems on the development of economic theory. (Spring)

105 **Economic Conditions Analysis and Forecasting** (3) Kendrick
Theory and empirical analyses of economic trends and fluctuations; use of economic indicators and simple econometric models. (Fall)

121 **Money and Banking** (3) Barth
Nature of money, credit, commercial banking, and other financial institutions in the U.S. monetary system. (Fall and spring)

122 **Monetary Theory and Policy** (3) Aschheim, Barth
Analysis of role of money in economic activity in terms of supply of and demand for loanable funds, interest rates and price level. Problems of U.S. monetary policy. Prerequisite: Econ 121. (Spring)

†123 **Introduction to Econometrics** (3) Sines, Sickles
Construction and testing of economic models; regression theory, parameter estimation and statistical techniques applicable to eco-

* Interdepartmental course offered by the East Asian Languages and Literatures, Economics, Geography and Regional Science, History, Sociology, Political Science and Statistics Departments.
† Interdepartmental course offered by the Economics and Statistics Departments.

nomic models. Prerequisite: Econ 101, 102; Math 31 or 41; Stat 111. (Spring)

130 **Comparative Economic Systems** (3) Aschheim, Yin

Critical exposition of fundamental economic concepts and theories of capitalism, communism, socialism, and fascism.

133 **Economy of the Soviet Union** (3) Hardt

Development and main features of economic life in the Soviet Union. (Fall)

134 **Comparative Communist Economic Systems** (3) Hardt

Analysis of economic development and performance of the Soviet Union and other Soviet-type economies. Institutional aspects and quantitative measures of performance. (Spring)

136 **Natural Resources and Environmental Economics** (3) Yezer

Analysis of market mechanisms for allocating energy and natural resources; cases of market failure in the use of the environment; policies to improve resource allocation using market and regulatory strategies. (Spring)

141 **Women in the Labor Market** (3) Haber

Application of the theory of the household and investment in human capital to female labor force participation, marriage, and family formation; analysis of sex discrimination. (Fall)

142 **Labor Economics** (3) Haber

Analysis of labor supply and demand; measurement and theory of unemployment; occupational choice, wages, prices, and unemployment; poverty and income maintenance. (Spring)

*147 **Economic History of Europe** (3) Sharkey

European economic development since the Middle Ages; emphasis on the period following the Industrial Revolution. Evolution of capitalism and its impact upon the societies of Europe. (Spring)

†153 **Poverty in America** (3) Boeckmann, Yezer

Exploration of social and economic causes of poverty in the United States and evaluation of present and proposed anti-poverty strategies, including comprehensive welfare reform. Discussion of conflicts between sociological and economic models of behavior of low income groups.

157 **Urban and Regional Economics** (3) Yezer

Analysis of the determinants of urban growth and development; firm location; the functioning of urban land and housing markets.

158 **Industrial Organization** (3) Long

Analysis of the structures and production, pricing, and related practices of industries with emphasis on their significance and on appropriate economic policies. (Spring)

160 **Social and Economic Indicators** (3) Staff

161 **Public Finance I** (3) Cordes

Theoretical and institutional analysis of government expenditures, taxation, and intergovernmental fiscal relations. (Fall)

[illegible]mental course offered by the Economics and History Departments.

†Experimental course offered by the Economics and Sociology Departments.

162 Public Finance II (3) — Cordes

Theoretical and institutional analysis of fiscal policy and debt management. (Spring)

165 Economics of Human Resources (3) — Stewart, Goldfarb

Economic analysis of education and training, health care, and other contemporary problems. (Fall)

169 Introduction to the Economy of Communist China (3) — Yin

Background, organization, and operation of the economy. Appraisal of performance and analysis of problems of development. (Fall)

170 Introduction to the Economy of Japan (3) — Hadley

Analysis of the structure and growth of the Japanese economy. (Spring)

***179–80 U.S. Economic History** (3–3) — Sharkey

Process of economic growth from Colonial times to the present. Development of various sectors in the economy and their interdependence. Econ 179: 1607–1865. Econ 180: 1865 to present. (Academic year)

181–82 International Economics (3–3) — Dunn, Aho

Econ 181: international trade theory and international monetary theory. Econ 182: continuation of international monetary theory; economic development. (Academic year)

185 Economic History and Problems of Latin America (3) — Staff

Analysis of present structures and problems of Latin American economies. (Spring)

198 Proseminar in Economics (3) — Stewart, Aschheim, Long

Examination of major topics in economic theory and the application of theory and analysis to policy problems. Open only to economics majors in their senior year. (Fall and spring)

199 Independent Research in Economics (3) — Staff

Under the personal direction of an instructor. Limited to economics majors with demonstrated capacity. Prior approval of instructor required. (Fall and spring)

Third Group

Third-group economics courses (except 217 18) are designed for graduate students in economics or for graduate students with prescribed prerequisites.

202 History of Economic Thought (3) — Hsieh

Critical analysis and interpretation of the development of economic theory from Plato through the "Keynesian Revolution" and the "Monetarist Counter-revolution." (Fall and spring)

203–4 Microeconomic Theory (3–3) — Goldfarb, Metzger

Econ 203: demand, production. Prerequisite: Econ 101 or equivalent. Econ 204: market structure, income distribution, intertemporal allocation, welfare economics; other topics. Prerequisite: Econ 203. (Econ 203 and 204—fall and spring)

* Interdepartmental course offered by the Economics and History Departments

205 **Macroeconomic Theory I** (3) Hsieh, Barth, Neftci

Theories of income, employment and the price level; aggregate supply and demand; consumption, saving, investment and the multiplier; supply and demand for money; government's and central bank's role in the economy. (Fall and spring)

206 **Macroeconomic Theory II** (3) Hsieh, Barth

Capital and growth theory. Discussion of Cambridge controversy in the theory of capital and one- and two-sector models of economic growth. Other selected advanced topics in macroeconomics. (Fall and spring)

207 **Business Cycle Analysis** (3) Kendrick

Empirical analysis of American business cycles, evaluation of the methodology and findings of the National Bureau of Economic Research. (Spring)

208 **National Income** (3) Kendrick

Theory and measurement of economic aggregates within an integrated national income accounts framework, including balance sheets and wealth statements. (Spring)

210 **Economic Methodology** (3) Stewart

Methodology of economics, review of selected theoretical issues in economic theory. Prerequisite: six semester hours of graduate courses in economic theory. (Spring)

212 **Economics of Property Rights** (3) Staff

Application of microeconomic theory to decision-making within business and government organization subject to alternative institutional constraints. Prerequisite: Econ 101. (Spring)

215–16 **Mathematical Economics** (3–3) Sines

Formulation and application of mathematical models in economic theory. Prerequisite: a one-year calculus sequence. Open to undergraduates. (Academic year)

217–18 **Survey of Economics** (3–3) Holman

For graduate students in fields other than economics. Econ 217, price theory; Econ 218, income and employment theory. Departmental prerequisite waived. (Econ 217 and 218—fall and spring)

223–24 **Monetary Theory and Policy** (3–3) Aschheim, Barth

Theory of monetary policy within the framework of contemporary American central banking. (Academic year)

233 **Seminar: Agrarian Reform, Income Distribution and Development** (3) Carroll

Equity and income redistribution issues in the context of current developmental programs, stressing land reforms and recent Latin American experience. (Fall)

234 **Seminar: Rural and Regional Development Projects** (3) Carroll

Design and evaluation of rural-based investment projects, with case studies drawn from experience of international agencies, especially in Latin America. (Spring)

235 **Energy Resources and Policy** (3) Staff

Consideration of economic and related policy issues directed at energy problems. (Fall)

237 **Economics of the Environment and Natural Resources** (3) Holman
Analysis of public policy problems relating to the environment and natural resources development and management. (Spring)

241–42 **Labor Economics** (3–3) Goldfarb
Theory of wages and employment, analysis of labor supply and demand. Structural unemployment, occupational choice; labor market discrimination. (Academic year)

243 **Seminar: Manpower Policy** (3) Levitan
Developments leading to expansion of public investment in manpower resources, evaluation of goals and operations of publicly supported programs. Open to undergraduates. (Fall)

244 **Economics of Education** (3) Staff
Returns to investment in education, allocation of resources to and within education, educational financing.

245–46 **Industrial Organization** (3–3) Long, Strickland
Structure and performance of the American economy; emphasis on the economics of antitrust policy and the impact of government regulatory policies. (Academic year)

247 **Seminar: Industrial Organization** (3) Long
Selected topics in regulatory economics and in antitrust economics during alternate years. Topics for 1978: antitrust problems. Prerequisite: Econ 101 or equivalent. (Spring)

248 **Health Economics** (3) Scheffler
Demand for medical care; organization of the health care delivery industry; policy issues on regulation, efficiency and allocation of health care services.

251 **Economic Development Theories** (3) Havrylyshyn
Basic theories of economic growth and development. Emphasis on theories inspired by the underdevelopment process. (Fall and spring)

252 **Economic Development Issues** (3) Havrylyshyn
Topics of current importance in underdeveloped countries, such as income distribution, industrial policies, economic integration, and cultural development, and economic planning. Prerequisite: Econ 251. (Spring)

253 **Productivity Analysis** (3) Kendrick
Concepts, measurement, and analysis of productivity in business and government at aggregate and organizational levels. (Fall)

254 **Economics of Advertising and Information** (3) Tuerck
Theory and empirical analyses of the role of advertising and information in industry structure and performance. (Fall)

255 **Economics of Technological Change** (3) Stewart
Economic principles related to determining the proper federal role in influencing civilian-oriented technological change. (Fall)

257 Regional Economics (3) — **Yezer**

Analysis of firm location, patterns of interregional or intermetropolitan production, urban and regional growth and patterns of development. (Fall)

258 Urban Economics (3) — **Yezer**

Analysis of spatial relationships among economic activities within an urban area including the urban land, labor, and housing markets; urban transportation models; fiscal relationships among jurisdictions. Prerequisite: Econ 257 or permission of instructor. (Spring)

259 Income Distribution (3) — **Staff**

Theoretical and empirical analyses of income distribution, including analysis of policies related to income inequality. Open to advanced undergraduate economics majors. (Fall)

261 Welfare Economics (3) — **Stewart**

Theories of welfare economics and their applications to public policy; analysis of selected topics in public policy. (Fall)

263 Theory of Public Finance I (3) — **Cordes**

Allocation and distribution aspects of government budget policy, including critical analysis of theories and principles of expenditures, stabilization, and intergovernmental fiscal relations. (Fall)

264 Theory of Public Finance II (3) — Cordes

Analysis of the effects of taxation on resource allocation and income distribution; impact of the public debt. (Spring)

265 Readings in International Taxation (3) — Snellingen

Examination of topics in economic theory and policy of international taxation: taxation of foreign currency and multinational corporations, tax evasion and tax havens, and tax systems for economic development. (Fall)

267 Seminar: Soviet Economy (3) — Hardt

Development of the Soviet-type economy. Organization, policies, and problems: monetary, production, allocative, foreign trade, economic growth. Admission by permission of instructor. (Fall)

268 Seminar: Economic Theory and Development in Communist Countries (3) — Hardt

Appraisal of the Soviet model for economic development in the communist world, especially in Eastern Europe and China. Admission by permission of instructor. (Spring)

269 Economy of Communist China I (3) — **Yin**

Analysis of organization, operation, policies, and problems. Development of the economy under communism. (Fall)

270 Economy of Communist China II (3) — **Yin**

Continuation of Econ 269, examining critical problems of development. Prerequisite: Econ 269 or permission of instructor. (Spring)

271 Economy of Japan (3) — **Hadley**

Analysis of Japanese economic institutions and their contribution to Japan's development. (Fall)

*275 **Econometrics I: Introduction** (3) Sickles, Neftci
Single equation models of economic behavior. Statistical methods for testing economic hypotheses and estimating parameters. Introduction to simultaneous equation problems. Prerequisite: Stat 157–58 or equivalent, or permission of instructor. Some exposure to matrix algebra is suggested. (Fall)

*276 **Econometrics II: Simultaneous Equation Models** (3) Sickles
Economic models and simultaneous equation systems. Prerequisite: Econ 275. Recommended, a course in matrix theory. (Spring)

*279 **Methods in Economic Statistics** (3) Gastwirth, Neftci
Application of statistical methods to economics. Curve-fitting, regression, analysis of variance, and chi-square techniques used to analyze economic data. Prerequisite: a one-year course in statistics. (Fall and spring)

281–82 **International Economics** (3–3) Dunn, Aho
Econ 281: theory of international trade and factor movements. Econ 282: international finance. (Academic year)

285–86 **Economic Development of Latin America** (3–3) Grunwald
Econ 285: development models, import substitution, and industrialization, underemployment, inequality, and policies for employment and income redistribution. Econ 286: theory and performance in trade, economic integration, planning for development; foreign aid, foreign investment, technology transfers. (Academic year)

287 **Seminar: Problems in Latin American Civilization** (3) Staff
Interdisciplinary seminar partially guided by a specialist within the methodology of his chosen discipline; each student writes a report on some aspect of a selected key theme. Admission by permission of instructor. (Spring)

†290 **Principles of Demography** (3) Staff
Introduction to basic demographic perspectives and data; methods for analysis of population size, distribution, and composition; determinants and consequences of population trends. (Fall)

†291 **Methods of Demographic Analysis** (3) Staff
Basic methods for analysis of mortality, natality, and migration; population estimates and projections; estimation of demographic measures from incomplete data. (Spring)

298 **Reading and Research** (3) Staff
Limited to Master's degree candidates. (Fall and spring)

299–300 **Thesis Research** (3–3)
(Fall and spring)

Fourth Group

Fourth-group economics courses are limited to graduate students and are primarily for doctoral candidates. They are offered as the demand requires.

* An interdepartmental course offered by the Economics and Statistics Departments.
† An interdepartmental course offered by the Departments of Economics, Geography and Regional Science, Sociology, and Statistics.

305 Seminar: Macroeconomics (3) **Staff**
Selected topics in macroeconomics. Prerequisite: Econ 205.

312 Seminar: Price Theory (3) **Staff**
Discussion of topics of price theory from recent journal articles.

313 Seminar: Economic Thought (3) **Hsieh**
Continuation of Econ 202. Principal trends in economic thought.

315 Seminar: Topics in Mathematical Economics (3) Solomon
Intensive study of selected topics, including economic activity analysis, risk and uncertainty, and other topics of current interest. Prerequisite: Econ 215–16.

321 Seminar: Monetary Theory (3) Aschheim
Recent developments in monetary theory.

341 Seminar: Labor Economics (3) **Staff**
Current problems in theory and policy.

363 Seminar: Public Finance (3) **Staff**
Selected topics of current interest.

*378 **Seminar: Topics in Econometrics** (3) Staff
A research seminar covering current econometric literature and special topics. Admission by permission of instructor.

†379–80 **Readings in Economic History** (3–3) Sharkey
Econ 379: American economic history. Econ 380: modern European economic history. Prerequisite: the appropriate second-group preparation and consent of instructor. (Academic year)

390 **Seminar: International Economic Theory** (3) Staff
Limited to graduate students, primarily for doctoral students. Examination of recent contributions in this field.

391 **Seminar: International Economic Policy** (3) Staff
Topics selected from current significant policy problems.

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) **Staff**
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

EDUCATION

Professors M.E. Coleman, D. Sinick, R.E. Baker, M.N. Rashid, R. Tillman, A. Marinaccio, L.H. Elliott, I. Nadler, M. Brenner, J.G. Boswell (Chairman), C.E. Vontress, R.J. Frankie, S. Kavruck (Visiting), M. McIntyre, D.A. Moore, L. Winkler, D. Linkowski, F.J. Brown (Visiting), E.P. Kulawiec

* An interdepartmental course offered by the E[illegible] and Statistics Departments
† An interdepartmental course offered by the Economics and History Departments

Professorial Lecturers W.W. Chase, A. Drexler, D. Iwamoto, A.C. Jensen
Associate Professors G.L. Horrworth, R.I. Peterson, G.D. Wiggs, S.R. Paratore, G.W. Smith, J.W. Fleck, M. Burns, J.C. Heddesheimer, J.A. Greenberg
Associate Professorial Lecturers T.R. Howie, R. E. McNelis
Assistant Professors J.R. Blank *(Research)*, R.A. Luke *(Visiting)*
Adjunct Assistant Professor **J. Noel**
Assistant Professorial Lecturers J.D. Gates, M.R. Phelps, W.N. Davis, D.G Altscher, P. Callas
Instructor C.B. Stapp *(Research)*
Lecturers C.S.J. Gage, M.F. Kelso, S.A.R. Hoth

Programs of study leading to the degrees of *Bachelor of Arts in Education*, *Master of Arts in Education*, *Master of Arts in Teaching*, *Education Specialist*, and *Doctor of Education* are offered by the School of Education and Human Development (see pages 101–31).

Second Group

Educ 136, 137, 138, 139, 140, 144, and 146 are special methods courses which are to be elected in the senior year by students in the secondary school curriculum after substantial preparation in the teaching fields concerned. Course requirements and hours of credit vary with license requirements. Prerequisite to all special methods courses: Educ 104, 105 for elementary majors; Educ 181 for secondary majors.

100 **Special Workshop in Education and Human Development** (arr.) Staff
Topics to be announced in the *Schedule of Classes*. May be repeated for credit. (Fall and spring)

101 **Career Choices in Education and Human Services** (3) Horrworth, Burns
Introduction to the wide variety of careers available in education and human development services: early childhood through college, museum, rehabilitation, industry, publishing, community, recreation, tourism, and government settings. Visits to selected sites. (Fall and spring)

102 **Introduction to Human Development I** (3) McIntyre
Lectures and site visits. All aspects of development through the early childhood stage. Field experiences based on wide variety of child study techniques. (Fall and spring)

103 **Introduction to Human Development II** (3) McIntyre
Lectures and three-hour fieldwork sessions. Development from middle childhood on. Cultural, familial, and societal influences highlighted. (Fall and spring)

104 **Psychology for Learning and Teaching** (3) Horrworth
Principles, theory, nature and course of learning and teaching processes. Examination and analysis of the strategies and dynamics of teaching and learning in behavioral settings. Three-hour fieldwork sessions. (Fall and spring)

105 **Society and the School** (3) Boswell
Historical and social development of education, contemporary issues, cooperation of the school with other community agencies, functions of school personnel. (Fall and spring)

110 Elementary School Teaching of Reading (3) Horrworth

Introduction to methods, techniques, materials, and activities essential to a good elementary school reading program. Prerequisite: Educ 104 and 105 or teaching experience.

111 Elementary School Curriculum and Methods (15) Moore and Staff

Diagnostic reading, mainstreaming, mathematics, science, language arts, social studies, music, art, physical education. Pre-student teaching one and one-half days a week. Prerequisite: Educ 102, 103, 104, 105; and senior standing. (Fall)

112 Measurement and Evaluation (3) Staff

Basic evaluative measurement techniques: selection, administration and interpretation of standardized tests, test construction, evaluation procedures, statistical analysis. (Fall and spring)

113 Elementary School Art (3) Staff

Lecture and laboratory (3 hours), field work—as arranged. For undergraduates in the elementary school curriculum. Materials and methods. Material fee, $5. (Spring)

118 Elementary Reading: Classroom Diagnosis and Instruction (3) Horrworth

Emphasis on diagnostic procedure aimed at individualizing and improving classroom instruction. Prerequisite: Educ 110 or equivalent. (Fall and spring)

121 International Experiences (1 to 6) Staff

Travel to a foreign country for study of a specific topic. (Fall and spring)

124 Communication Skills and Interpersonal Relationships (3) Brenner

Theory and practice in the development of professional relationships and communications: teacher-student, museum-school, group strategies. The interview.

125 Museums in Washington (3) Hoth

Introduction to use of museum collections and services. Museum visits will include unusual collections in art, history, and natural science.

128 Children's Literature (3) McIntyre

Lecture (2 hours), field work (2 hours). Newer books for children and the children's classics, contribution of literature to child development. (Spring)

131 Secondary School Principles and Methods (3) Kulawiec

For seniors. Classroom management and teaching techniques for initiating, guiding, and evaluating learning activities. Group-work to be arranged. Prerequisite: Educ 104 and 105. (Fall)

132 Student Teaching in Early Childhood Schools (6 to 9) McIntyre

For seniors. Admission by permission of instructor. Prerequisite: Educ 111 or equivalent; Educ 150, 152, 153. (Fall and spring)

133 Supervised Experience in Education and Human Development Services (3 to 6) Staff

Field work, internship, and instructional practice: (1) adult education and human resource development (Wiggs); (2) college student devel-

opment experience (Burns); (3) higher education (Frankie); (4) museum education (Brenner); (5) counseling (Heidelsheimer). Admission by permission of instructor. (Fall and spring)

134 **Student Teaching in Secondary Schools** (6 to 9) — Kulawiec, and Staff

For seniors. Admission by permission of instructor. Prerequisite: Educ 131. (Fall and spring)

135 **Student Teaching in Elementary Schools** (6 to 9) — Moore and Staff

For seniors. Admission by permission of instructor. Prerequisite: Educ 111 or equivalent. (Fall and spring)

136 **Teaching English in Secondary Schools** (3) — McNelis

Lecture (2 hours), field work (2 hours). Prerequisite: 18 semester hours in English. (Spring)

137 **Teaching Speech** (3) — Staff

Lecture (2 hours), field work (2 hours). Prerequisite: 18 semester hours in speech or permission of instructor. (Spring)

138 **Teaching Social Studies in Secondary Schools** (3) — Boswell

Lecture (2 hours), field work (2 hours). Prerequisite: 24 semester hours of social studies. (Spring)

139 **Teaching Art in Secondary Schools** (3) — Staff

Lecture (2 hours), laboratory (2 hours). Prerequisite: 24 semester hours of Art. Material fee, $5. (Spring)

140 **Teaching Mathematics in Secondary Schools** (3) — Gates

Lecture (2 hours), field work (2 hours). Prerequisite: mathematics through calculus. (Spring)

144 **Teaching Science in Secondary Schools** (3) — Kulawiec

Lecture (2 hours), field work (2 hours). Prerequisite: 24 semester hours of science. (Spring)

146 **Teaching Foreign Languages** (3) — Kulawiec

Lecture (2 hours), field work (2 hours). Prerequisite: 18 semester hours of one foreign language. (Spring)

150 **Foundations of Early Childhood Education** (3) — McIntyre

Historical developments, philosophy, and objectives of nursery schools, kindergartens, and day care centers; exploration of contemporary programs and models with curriculum implications for schools in the U.S. and abroad. Admission by permission of instructor. (Fall)

152 **Early Childhood Curriculum** (3) — McIntyre

Writing, content, approaches, methods, and materials in language arts, mathematics, science, health, social studies, and aesthetic education. Admission by permission of instructor. (Fall)

153 **Role of the Professional in Early Childhood Education** (3) — McIntyre

Planning, reporting, records, teacher-child and teacher-family interaction, diagnosis and evaluation, working with paraprofessionals. Admission by permission of instructor. (Spring)

154 **Community Resources and Materials for the Young Child** (3) McIntyre

Interaction with community agencies for services and resources; physical facilities, including play activities and curriculum materials for the young child. Admission by permission of instructor. (Spring)

161 **Human Development** (3) **Rashid**

Consideration of human development and behavior throughout the life span; emphasis on practical implications of relevant interdisciplinary research. (Fall and spring)

162 **Foundations of Counseling** (3) Heddesheimer, Winkler

Introductory survey: definitions, scope, principles, historical background, organization, services, emerging trends, and issues. (Fall and spring)

163 **Personal and Social Adjustment** (3) Winkler

Mental health problems, emphasis on needs of counselors, teachers, and others working with children and adolescents. (Fall and spring)

171–72 **Seminar: International Education** (3–3) Moore

Survey of selected foreign educational systems and cultures. Research techniques and materials to develop world-mindedness. Embassy resources utilized. (Fall and spring)

173 **Comparative Education** (3) **Kulawiec**

A systematic investigation of the educational structure and practices of selected representative school systems throughout the world. Emphasis on development of a methodology for comparative study. (Fall)

176 **Group Theories and Techniques** (3 or 4) Burns

Group interaction in dyads, reference groups, and complex organizations. Focus on theorists including Argyris, Bales, Berne, Lewin, and Sherif. One additional semester hour for techniques laboratory is optional. Prerequisite: permission of instructor. (Spring)

178 **Designing and Implementing Conferences and Meetings** (3) Nadler

Same as HKLS 178. Use of design committees, steering committees, selection of resource people, site selection, exhibits, and relation to supplier personnel. Special attention to designing the core of the conference and related conference activities. (Fall)

193–94 **Research and Independent Study** (arr.) Staff

Individual research under guidance of a staff member. (Academic year)

Third Group

Departmental prerequisite: A degree from an accredited institution is prerequisite to all third group courses in education. Adequate professional preparation is prerequisite to all third-group courses in education except for those courses limited to students in the M.A.T. degree program. Undergraduate students in their senior year may enroll in third-group courses with permission from the instructor.

200 **Special Workshop in Education** (arr.)
Topics to be announced in *Schedule of Classes*. May be repeated for credit.

201–2 **International Education** (3–3) Moore
Survey of selected foreign educational systems and cultures. Research, techniques, and materials to develop world mindedness. Embassy resources utilized. (Summer)

203–4 **Comparative Education** (3–3) Kulawiec
A systematic investigation of the educational structure and practices of selected representative school systems throughout the world. Emphasis on development of a methodology for comparative study. (Fall)

205 **The Curriculum** (3) Horrworth
For experienced teachers. Curriculum foundations and issues, comparison of curriculum patterns, curriculum development in subject areas, and group consideration of student problems.

207 **Curriculum Materials** (3 to 6) Horrworth
For experienced teachers. Construction of courses of study and classroom teaching aids, with direct application to students' situations.

208 **Human Development** (3) Rashid
Consideration of human development and behavior throughout the life span; emphasis on practical implications of relevant interdisciplinary research. (Fall and spring)

209 **Child Development** (3) Rashid
Interdisciplinary approach to child development and behavior. Practical implications of research in disciplines contributing to knowledge about childhood. (Fall)

210 **Adolescent Development** (3) Rashid
Interdisciplinary approach to adolescent development and behavior. Practical implications of research in disciplines contributing to knowledge about adolescence. (Spring)

212 **Quantitative Methods I: Introduction to Survey Measurement and Research** (3) Paratore, Smith, and Staff
Introduction to measurement techniques and evaluation. Emphasis on application and interpretation of data gathering techniques and descriptive statistics.

213–14 **History of Education** (3–3) Boswell
Educ 213: Education as a major factor in the development of world civilization from the invention of writing to the industrial revolution. Educ 214: evolution of the American school system. (Alternate academic years)

217–18 **Philosophy of Education** (3–3) Kulawiec
Educ 217: to help students formulate a personal philosophy of education. Educ 218: social foundations of education -forces that shape policies and offerings of the school. (Alternate academic years)

219 **Elementary School Classroom Procedures** (3) Baker
Current theories of teaching and learning and their application to teaching strategies of elementary school teachers. (Spring)

221 **International Experiences** (1 to 6) Staff

Travel to a foreign country for study of a specific topic. (Fall and spring)

222 **Foundations of Reading Instruction—Early Childhood and Elementary School** (3) Coleman

Historical and psychological background; readiness, special approaches and skills for beginning and elementary readers; evaluation of materials; demonstrations of diagnostic, classroom, and instructional techniques. (Fall)

223 **Foundations of Reading Instruction—Intermediate and Secondary School** (3) Coleman

Emphasis on content areas; historical overview and need for teaching reading on these levels; informal diagnostic techniques, selecting and teaching materials, basic reading and study skills and their application in content areas. (Fall)

224 **Diagnostic Teaching of Reading** (3) Coleman

Classroom diagnostic and instructional techniques for elementary school level; construction of informal tests; administration, scoring, and interpretation of informal and standardized tests; study of materials and application of readability formulas. Prerequisite: at least one previous course in reading. (Spring)

226 **Reading in Secondary School** (3) Coleman

Extension of diagnostic and instructional techniques in Educ 223; construction of informal tests; administration, scoring, and interpretation of informal and standardized tests; evaluation of materials, including application of readability formulas; study of reading programs. Permission of instructor required. (Spring)

227 **Basic Issues in Elementary Education** (3) Baker

Identification, definition, and analysis of some of the most important problems facing the contemporary American elementary school. (Fall)

228 **Instructional Areas in Elementary Education** (3) Baker

Current trends and research in reading, language arts, social studies, mathematics, science, music, art, and physical education.

233 **Audiovisual Education** (3) Kubalak

Lecture (2 hours), laboratory (1 hour). Selection, evaluation, and use of audiovisual materials; administrative problems in care, operation, maintenance, and use of such materials and equipment. Material fee, $7. (Spring)

234 **Organization for Personalized Learning in the Open Classroom** (3) Horrworth

Practical application of individualized instruction theories and methods through design, development, implementation, and revision of elementary and secondary level self-instructional packages.

235 **Analysis of Teaching** (3) Boswell

Teaching as work; diagnosing learning skills, program planning and implementation, feedback information on both student and program. (Fall)

236 **Introduction to Education Technology** (3) Staff
Consideration of historical perspective, process, instrumentation, and implementation of self-instructional systems.

237 **Systems Approach to Instructional Design** (3) Wiggs
Application of systems techniques to the development of instructional programs. A workshop design, using multi-media instruction. (Summer)

241 **Education of the Gifted** (3) Rashid
For classroom teachers. Nature and discovery of giftedness, provisions for the gifted in regular classes, experimental projects.

242 **The Teacher and School Administration** (3) Brown, Fleck
Role of federal, state, and local administrative units; school finance; legal controls, school plant, public support, improving teaching conditions. (Fall)

243 **Human Relations in Education and Management** (3) Marinaccio
Principles and practices in human relations between and among learner, teacher, other school personnel, parents, and community.

245 **School and Community** (3) Marinaccio
The school as an important member of a team of social agencies that builds the community.

246 **Administrative Issues in Urban Education** (3) Staff
Investigation of current issues in urban education. (Fall and spring)

247 **Post-Secondary Occupational Education** (3) Greenberg
Development, current concepts, agencies involved, problems, and trends in vocational, technical, and occupational education in the United States, with emphasis on the community college. (Spring)

248 **The Teacher and School Supervision** (3) Tillman, Brenner
Nature, organization, human relationships, and techniques. (Fall)

249 **Drug Treatment and Resources** (3) Staff
Individual, social, and cultural factors related to drug abuse. Rehabilitative methods in treating drug abusers; use of community resources. (Spring)

250 **Counseling Drug Abusers** (3) Staff
Counseling theory and practice applied to drug abusers. Crisis intervention, self-help groups, and family therapy; individual and group counseling. (Fall)

251 **Foundations of Counseling** (3) Heddesheimer, Winkler
Introductory survey: definitions, scope, principles, historical background, organization, services, emerging trends, and issues. (Fall and spring)

252 **Organization and Administration of Counseling Services** (3) Vontress
Principles and procedures for designing and implementing counseling services. Admission by permission of instructor. (Spring)

253 **Individual Appraisal in Counseling** (3) Winkler

Detailed study of individual analysis and appraisal techniques. Development of systematic case study. Prerequisite: Educ 112 or equivalent. (Fall and spring)

254 **The Middle School** (3) Kulawiec

Development, organization, and practices; emphasis on the learner, the teacher, the administrator, the curriculum, and the setting of the school for the preadolescent. (Fall)

255–56 **Secondary Education** (3–3) Kulawiec

Examination of historical, psychological, sociological, and philosophical bases, emphasis on prescriptive implications. Special attention to contemporary problems and practices. (Academic year)

257 **Career Development and Information** (3) Sinick, Vontress

Theories of career development; factors influencing the world of work, procedures for evaluating and using socio-personal, educational, and occupational information. (Fall and spring)

258 **Theories and Techniques of Counseling** (3) Heddesheimer, Vontress

Theories and practices of vocational, educational, and personal counseling. Prerequisite: 12 semester hours in guidance and counseling, including Educ 253 and 257. (Fall and spring)

259 **Administration of the Elementary and Secondary School** (3) Fleck

For experienced teachers and administrators. Survey of administration, including practices of modern schools. (Fall)

260 **Supervision in the Elementary and Secondary School** (3) Fleck, Brenner

For experienced teachers and administrators. Review of modern supervisory concepts, including practices in schools. (Spring)

261 **Practicum in Counseling and Human Development** (3) Staff

Intensive counseling experience under supervision. Emphasis on relationship dynamics, analysis, recommendations and follow-up. Separate sections offered for counseling majors and human development majors. Prerequisite: Educ 258. (Fall and spring)

262 **Internship in Counseling and Human Development** (3) Staff

Counseling experience under University and institutional supervision in a variety of settings. Separate sections offered for counseling majors and human development majors. Admission by permission of instructor. (Spring)

263 **Human Resource Development: Training and Education** (3) Wiggs, Nadler, Luke

Concepts and purpose, historical backgrounds, roles of human resource development personnel, program areas. Prerequisite: adequate professional preparation or experience in training, education, and development. (Fall)

264 **Design of Training Programs in Human Resource Development** (3) Nadler, Luke

Training, education, and development programs for various client systems will be planned using critical events conceptual model. Field work. Prerequisite: Educ 263 and permission of instructor. (Spring)

265 **Futurism and Education** (3) Kulawiec
Contemporary view of the future through readings, discussion, simulation, games, and films. Impact of technology on humans and the environment. Future shock, alternative futures, overchoice. (Summer)

268 **Family Counseling** (3) Winkler
The family as a system: how it affects the client and how the client affects it. Didactic presentations, role playing, and work with simulated families. (Spring)

269–70 **School Business Management** (3–3) Fleck
Educ 269: philosophy, responsibilities, and functions of the business management office in public education institutions. Educ 270: practicum in educational business management. (Academic year)

273 **Pre-Service Teacher Education** (3) Boswell
Program development, governance, issues, trends. (Fall, alternate years)

274 **In-Service Teacher Education** (3) Boswell
Continuing professional development of educators, costs and benefits to society, promising programs and practices, current issues. (Spring, alternate years)

275 **School Finance** (3) Brown
Educational financial theory, practice, and control, including methods of financing. (Fall)

276 **Public Relations in School Administration** (3) Brown
Purposes, gathering materials, disseminating agencies, publicity media, public participation in policy-making. (Spring)

277 **Dynamics of Change in Education** (3) Boswell
An analysis of the process of cultural change in Western society, with emphasis on education. Comparison of theories; analytical tools; historical precedents; the contemporary situation, prospects for the future.

278 **School Law** (3) Fleck
Sources and scope of school law; legal rights and responsibilities of teachers, pupils, and taxpayers. Other legal problems of major interest to the group. (Spring)

279 **Adult Education** (3) Nadler, Wiggs
Current concepts and objectives, historical development, agencies involved, personnel, clients, programs on all levels—community through international. (Fall)

280 **Program Planning in Adult Education** (3) Wiggs, Luke
Determining educational needs for adults in school and non-school agencies; designing programs and instruction; budgeting and scheduling of adult programs. Field work with sponsoring agency. Prerequisite: Educ 279 and permission of instructor. (Spring)

283 **Higher Education in the United States** (3) Frankie
History, scope, purpose, present status, programs, and trends in higher education in the United States. (Fall and spring)

284 **Administration of Higher Education** (3) Marinaccio
Government, organization, and administration of colleges and universities; duties of trustees and administrators. (Fall and spring)

285 **Program Planning, Organization, and Coordination** (3) Burns
Focus on the skills and knowledge needed by student affairs professionals, faculty advisors, and college administrators in planning, budgeting, and dealing with policy issues related to campus programming. Includes program proposal preparation. (Spring)

287–88 **Clinical Study of Reading Problems** (3–3) Coleman, Peterson
For advanced students. Diagnostic and corrective work under supervision. Prerequisite: Educ 222 and 223 or 224 and 226. Material fee, $10 per semester. (Academic year)

289 **Organization and Administration of Reading Programs** (3) Peterson, Davis
For principals, assistant principals, supervisors, superintendents and reading teachers. Problems in planning, reorganizing and improving the total reading program. (Fall and spring)

290 **Severe Learning Disabilities in Reading** (3) Peterson
For experienced teachers. Case studies of children and/or adults with severe reading problems, planning and implementing instructional programs. Admission by permission of instructor. Material fee, $10. (Summer)

291 **Planning the School Plant** (3) Chase
Selection of sites; evaluation of existing buildings; utilization of present facilities; adaptation to curricular needs; building, operation, and maintenance problems. (Fall)

293–94 **Research and Independent Study** (3–3) Staff
Individual research under guidance of a staff member. Program and conferences arranged with an instructor. (Academic year)

295 **Quantitative Methods II: Research Procedures** (3) Paratore, Smith
Required of all candidates for masters' degrees in education. Analysis of scientific approaches to problems in education; evaluation of research techniques. Prerequisite: Educ 112, 212; or equivalent. (Fall and spring)

297 **Personnel Administration** (3) Brown
Organization and administration of personnel programs for educational institutions. Basic philosophy, principles, responsibilities, and functions.

299–300 **Thesis Research** (3–3) Staff
Required of M.A. in Ed. degree candidates writing master's theses. (Fall and spring)

302 **Quantitative Methods III: Inferential Techniques** (3) Paratore, Smith
Educ 302 or Stat 105 is required of all doctoral students in education. Prerequisite: Educ 212 or a basic statistics course and permission of instructor. (Fall and spring)

303 Data Analysis (3) — Paratore
Use of computer in data analysis. For doctoral students at the dissertation-planning stage. (Fall and spring)

304 Practicum in Supervision (3 to 6) — Fleck, Tillman
Practical experience in supervision of instruction. Admission by permission of instructor.

305 Internship: Supervision (3 to 6) — Fleck
Service in a school situation directed by the University's faculty and school systems; integration of theory and practice.

306 Quantitative Methods IV: Advanced Research Design (3) — Paratore, Smith
Required of all doctoral students in education. Evaluation and application of educational research designs. Prerequisite: Educ 302 or equivalent. (Fall and spring)

310 Museum Studies (3) — Stapp
Study of museums' functions and their educational roles.

311 Museum Audiences (3) — Brenner
Study of the many audiences of many ages who use and enjoy museums; appropriate museum practices, proposal writing.

312 Internship in Museum Education (6) — Stapp
Full-time placement in education departments in area museums. Supervision and seminar are provided by George Washington University faculty. Admission by permission of instructor.

316 Recent Developments in Elementary School Social Studies (3 to 6) — Moore
For experienced educational personnel. Research, techniques, materials, and innovative programs relating to the effective elementary school social studies curriculum. Admission by permission of instructor.

317 Recent Developments in Elementary School Science (3 to 6) — Staff
For experienced educational personnel. Research, techniques, materials, and innovative programs relating to the effective elementary school science curriculum. Admission by permission of instructor.

320 Recent Developments in Elementary School Mathematics (3 to 6) — Staff
For experienced educational personnel. Research, techniques, materials, and innovative programs relating to the effective elementary school mathematics curriculum. Admission by permission of instructor. (Spring)

321 Practicum in Curriculum (3 to 6) — Horrworth
Supervised field experience in curriculum. Admission by permission of instructor. (Fall and spring)

322 Internship: Reading (3 to 6) — Peterson
Limited to doctoral students in education. Experience in a selected area of college teaching. (Fall and spring)

323 **Internship: Reading** (3 to 6) Peterson

Limited to doctoral students in education. Service in a school situation directed by the University's faculty and school systems; integration of theory and practice. (Fall and spring)

324 **Teaching Reading and Study Skills at the College Level** (3) Peterson

Evaluation of reading skills at the college level. Development of college reading programs, including diagnostic and teaching techniques, program planning and implementation. Prerequisite: Educ 326 or equivalent, and permission of instructor. (Summer)

325 **Curriculum Theory** (3) Tillman

Examination of reviews and research studies in curriculum theory. Focus on trends, values, interpretations, fads, design systems, and evaluation. (Spring)

330 **Foundations of Early Childhood Education** (3) McIntyre

Historical developments, philosophy and objectives of nursery schools, kindergartens and day care centers, exploration of contemporary programs and models with curriculum implications for schools in the United States and abroad. (Fall)

332 **Early Childhood Curriculum** (3) McIntyre

Writing content, approaches, methods, and materials in language arts, mathematics, science, health, social studies, and aesthetic education. (Fall)

333 **Role of the Professional in Early Childhood Education** (3) McIntyre

Planning, reporting, maintaining records, teacher-child and teacher-family interaction, diagnosis and evaluations, working with paraprofessionals. (Spring)

334 **Community Resources and Materials for the Young Child** (3) McIntyre

Interaction with community agencies for services and resources; physical facilities, including play activities and curriculum materials for the young child. (Spring)

335 **Practicum in Early Childhood Education** (3 to 6) McIntyre

Supervised professional activity in selected early childhood programs, seminar. Prerequisite: 12 semester hours in early childhood education and permission of instructor. (Fall and spring)

336 **Practicum in Reading** (3) Coleman, Peterson, and Staff

Supervised experience in testing and teaching. Approximately 120 class hours required. Admission by permission of instructor. (Fall and spring)

341 **Cognitive Models and Instruction** (3) Rashid

Cognitive models (Guilford, Piaget, etc.) are analyzed as the theoretical basis for planning instructional episodes appropriate at various levels—childhood through adulthood. (Fall)

342 **Language Development** (3) Rashid

Nature of language development; role of language in the socialization process. (Spring)

343 **Advanced Studies in Human Development** (3) Rashid
Review and consideration of empirical research studies on selected topics in human development. Issues, instrumentation and research needs in respect to each topic discussed. Admission by permission of the instructor. (Spring)

353 **Counseling Older Persons** (3) Sinick
Special considerations and counseling emphases on second careers retirement adjustments, death and dying. (Spring)

354 **Cross-Cultural Counseling** (3) Vontress
Problems of and procedures for counseling culturally different clients. Emphasis on counseling cultural minorities in the United States. (Summer)

355 **Counseling in Groups** (3) Heddesheimer, Winkler
Principles of group dynamics as related to interaction within groups. Techniques and practice in group counseling (Fall and spring)

356 **Guidance and the Disciplines** (3) Staff
For experienced counselors. Exploring the foundations of guidance through the disciplines of psychology, sociology, economics, anthropology, and philosophy.

357 **Personal and Social Adjustment** (3) Winkler
Mental health problems, emphasis on needs of counselors, teachers, and others working with children and adolescents. (Fall and spring)

358 **Advanced Theories of Counseling** (3) Vontress, Heddesheimer
Critical analysis and evaluation of leading counseling theories and consideration of their implications for practice. Intended for Education Specialist and Doctor of Education degree candidates whose area of concentration is counseling. Admission by permission of instructor. (Fall)

360 **Job Development and Placement** (3) Sinick
Policies, principles, and processes involved in job development, modification, and placement. Emphasis on removal of barriers and on methods for placing members of special groups, such as the disabled. Admission by permission of instructor. (Spring)

361 **Medical Aspects of Rehabilitation Counseling** (3) Sinick
Etiology, symptomatology, and treatment of chronic and traumatic disorders with rehabilitation counseling implications. Admission by permission of instructor. (Fall)

362 **Client Evaluation in Rehabilitation Counseling** (3) Blank, Sinick
Test and non-test methods of bartering client and counselor understanding. Prerequisite: Educ 212 or equivalent (Spring)

363 **Psychosocial Aspects of Rehabilitation Counseling** (3) Linkowski, Blank
Impact of congenital and later disabilities on attitudes, self concepts, and motivations. Implications for rehabilitation counseling. Admission by permission of instructor. (Fall)

365-66 **Field Work in Rehabilitation Counseling** (3–3) Blank
Field work of one full day a week. Educ 365: concurrent seminar

cluding history, philosophy, and introduction to practice. Educ 366: concurrent seminar including job analysis, placement, and follow-up. Admission by permission of instructor. (Academic year)

367–68 **Internship: Rehabilitation Counseling** (6–6) Blank
Supervised practice of three full days a week, with seminar providing integration of theory and practice. Prerequisite: Educ 365–66. (Academic year)

369 **Professional Issues in Rehabilitation Counseling** (3) Sinick
Culminating seminar covering professional problems and ethical issues. Prerequisite: Educ 367. (Spring)

370 **College Students and Their Community** (3) Burns, Phelps
Survey of literature on the characteristics, behavior, and attitudes of the contemporary college student; college students' interaction with their environment. Admission by permission of instructor. (Fall)

371 **Principles and Practices in College Teaching** (3) Greenberg
General principles, methods, techniques and experimental instructional media for teaching at the college and university level. (Fall)

372 **Internship in College Teaching** (3 to 6) Greenberg
Supervised experience in a selected area of college teaching. Prerequisite: Educ 371. Admission by permission of instructor. (Spring)

373 **The Community-Junior College** (3) Greenberg
The two-year college as it relates to secondary education, four-year colleges and universities. Objectives, curricula, students, faculty, legal concerns, and special problems of two-year colleges. (Fall and spring)

374 **Current Issues in Higher Education** (3) Elliott, Marinaccio
Prerequisite: Educ 283, 284. (Spring)

375 **Foundations of College Student Development** (3) Burns
College student development as an integral part of higher education programs. (Fall)

376 **Group Theories and Techniques** (3 or 4) Burns
(Formerly College Student Development and Campus Groups)
Group interaction in dyads, reference groups and complex organizations. Focus on theorists including Argyris, Bales, Berne, Lewin, and Sherif. One additional semester hour for techniques laboratory is optional. Prerequisite: permission of instructor. (Spring)

377 **Practicum in College Student Development** (3 to 6) Burns
Supervised practical experience in college student development programs. Admission by permission of instructor. (Fall and spring)

378 **Practicum in Teacher Education** (3 to 6) Brenner, Boswell
For selected experienced teachers. Supervised field work relevant to students' professional needs, to be arranged. (Fall and spring)

379 **Practicum in Adult Learning Programs** (3 to 6) Nadler
Supervised practical experience in various forms of adult education and human resource development. Admission by permission of instructor. (Fall and spring)

380 **Sensitivity Training: Laboratory Method** (3) Staff
A sensitivity learning experience in human relations using unstructured group experience, individual feedback, experimentation, and practice. Admission by permission of department, prior to registration. (Fall and spring)

381 **Adult Learning** (3) Wiggs, Luke
Learning theories as applied to adults in individual and group learning transactions; effect of age on learning; psychological, physical and social environment in adult education situations. (Fall and spring)

382 **Instructional Strategies in Adult Learning Programs** (3) Nadler, Luke
Methods, techniques, and devices for adult learning; developing action-oriented learning situations in adult learning programs. (Spring)

383 **Interviewing-Counseling for Human Resource Developers** (3) Wiggs
Applications of interviewing, coaching and counseling skills for the human resource development specialist and others in various occupational settings. (Fall)

384 **Evaluation of Adult Learning Programs** (3) Wiggs
Evaluation of adult learning programs in business, industry, government, voluntary and community organizations, and agencies. (Fall)

385 **Collective Negotiations in Higher Education** (3) Frankie, Rhodes
Theory, practice, problems, and issues in collective negotiations in higher education.

386 **Current Issues in Adult Learning Programs** (3) Staff
For M.A. in Ed. degree candidates. Current issues and trends in the fields of adult education and human resource development. Admission of others by permission of instructor. (Spring)

387 **Administration of Adult Learning Programs** (3) Staff
Program administration in school and non-school agencies, staff recruitment and development, fiscal operations, facilities, and maintenance of effective community relations. (Fall)

388 **Case Studies in Higher Education Administration** (3) Marinaccio
Limited to advanced doctoral students in education. Analysis of selected hypothetical cases related to essential administrative functions of colleges and universities. Admission by permission of instructor.

389 **Consultant-Client Relationships in Human Resource Development** (3) Nadler, Luke
Examination of the consulting process, consultant-client behaviors, and dilemmas using theory and field experience for individual and organizational development. Prerequisite: Educ 264, 280; or approval of instructor. (Fall and spring)

390 **Legal Problems in Higher Education** (3) Frankie
Investigation of legal problems in higher education related to the legal structure of higher education, religious concerns, students, faculty, and academic programs. (Spring)

391 **College and University Curriculum** (3) Greenberg
Development, patterns, creative design, issues, problems, evaluation, and trends in the higher education curriculum. (Spring)

392 **Financing Higher Education** (3) Frankie
Analyses of private, state, and federal revenue sources; student aid; program budgets, and financial methods and practices. (Fall)

393 **Practicum in Higher Education** (3 to 6) Frankie, Greenberg
Supervised field experiences in higher education; reports and conferences. Admission by permission of instructor. (Fall)

394 **College and University Governance** (3) Marinaccio
Organizational and administrative structures, patterns, and relationships in higher education. Prerequisite: Educ 284. (Fall)

395 **Problems and Practices in Educational Administrative Organization** (3 to 6) Marinaccio
Application of principles and practices concerned with change and evaluation of educational administration.

396 **Internship: Higher Education Administration** (3 to 6) Marinaccio
Service in a higher education situation directed by the University and the cooperating institution to integrate theory and practice. (Fall and spring)

397 **Internship: Administration** (3 to 6) Staff
Service in a school situation directed by the University's faculty and school systems: integration of theory and practice. (Fall and spring)

399 **Seminar: Applied Educational Administration** (3 to 6) Fleck
Application of the theories and principles of administration to the public schools. Student participation with guidance by recognized regional practitioners

Fourth Group

A master's degree from an accredited institution is prerequisite to all fourth-group courses. All fourth-group seminars are open to doctoral candidates or other post-master's degree students with approval of instructor. Study is individually planned on the basis of previous study and experience in the subject field to attain an advanced level of competence and to meet identified professional needs or field requirements

Each of the following courses is offered fall and spring. Each course may be repeated for credit.

401 **Seminar: History of Education** (arr.) Boswell

403 **Seminar: Philosophy of Education** (arr.) Kulawiec

405 **Seminar: Human Growth and Development** (arr.) Rashid

411 **Seminar: Elementary Education** (arr.) Baker

413 **Seminar: Secondary Education** (arr.) Kulawiec

421 **Seminar: Adult Education** (arr.) Nadler

422 **Seminar: Higher Education Administration** (arr.) Marinaccio

423 **Seminar: Higher Education** (arr.) Marinaccio

424 **Seminar: College Student Development** (arr.) — Burns

425 **Seminar: Teacher Education** (arr.) — Boswell, Baker

427 **Seminar: Human Resource Development** (arr.) — Nadler

429 **Seminar: Educational Personnel Administration** (arr.) — Fleck

431 **Seminar: Administration** (arr.) — Staff

443 **Seminar: Counseling** (arr.) — Staff

445 **Seminar: Research and Evaluation** (arr.) — Paratore, Smith

446 **Seminar: Reading** (arr.) — Peterson

490 **Pre-dissertation Seminar** (3–6) — Staff

Required of all Ed.D. degree candidates. Approval of the dissertation research design is necessary for successful completion of the seminar. **Admission by permission of instructor.**

491 **Dissertation Research** (arr.) — Staff

Preparation of a research outline; research and writing of an approved doctoral dissertation under the direction of major adviser and dissertation committee. **Prerequisite: Educ 490.**

Fifth Group

701 **Experimental Course** (3) — Staff

721 **Experimental Course—Interdepartmental** (3) — Staff

EDUCATION POLICY—DOCTORAL PROGRAM

Committee on Education Policy

C.J. Lange *(Chairman)*, A.D. Kirsch, H.L. LeBlanc, P.H.M. Lengermann, M.N. Rashid, C.T. Stewart, Jr.

The Graduate School of Arts and Sciences offers an interdepartmental program leading to the degree of Doctor of Philosophy in the field of education policy. The program is directed by a committee whose members are drawn from the School of Education and Human Development and from the Departments of Economics, Political Science, Psychology, Sociology, and Statistics.

The scope of the program is policy research and analysis as it relates to education broadly conceived. It is intended for those who wish to pursue or continue academic careers or careers in policy-making positions.

Required: the general requirements, pages 88–91, 97–99. Candidates must complete three fields of study, one of which must be education policy analysis. Each candidate is to develop a concentration within one academic discipline.

201–2 **Seminar: Current Issues in Education Policy** (3–3) — Staff

Review of literature relating to current education policy issues with emphasis on use of research and analysis in formulating and evaluating policy.

*220 **History of Universities** (3) — Andrews

The modern university since about 1830: emphasis on recent trends and their origins; influence of earlier concepts and institutions

* Offered jointly by the Education Policy Program and the History Department.

Higher education in its larger intellectual, social and political context: critical examination of theories. Same as Hist 220. (Spring, odd years)

222 **Seminar: Topics in Education Policy** (3) Staff
Intensive investigation of special topics in education policy.

*254 **Seminar: Methods in Social Policy Research** (3) Boeckmann, Helmer
Systematic survey of conceptualization, design and practice of evaluation research of social experiments, and of simulation and technological forecasting. Prerequisite: Stat 166 Soc 250, 252, or permission of instructor. (Spring)

290 **Advanced Studies in Education Policy** (3) Staff
Supervised study and field work in selected policy areas.

ENGLISH

Professors C.D. Linton, P.H. Highfill, Jr., J.G. Allee, Jr., J.P. Reesing, Jr. (*Chairman*), E.R. Weismiller, R.N. Ganz, Jr.
Adjunct Professor J.C. Broderick
Associate Professors A.E. Claeyssens, Jr., R.C. Rutledge, J.A. Quitslund, J.A.A. Plotz, J.H. Maddox, C.W. Sten, G.R. Bozzini
Assistant Professors R.L. Combs, G. Carter, G. Paster, D. McAleavey, O.A. Seavey
Adjunct Assistant Professors C.H. Greer, L.S. Pena, F.C. Reid
Assistant Professorial Lecturers R.P. Rhinehart, C. Steinberg, K. Evans, L.A. Weigant, T.E. Daugherty, J.M. Deren, M. Galvin, E. Garnet, M. Morrison, J.N. Neri, M. Rogza
Adjunct Instructors M.A. Strom, H.D. Adamson, M. Cramer, E. Echeverria, M. Kirkland, C. Meloni, S. Thompson
Visiting Instructor C.T. Bader
Lecturers C.G. Beckford, J. Greene, S. Armstrong, B.E. Dick, J. Smith, N. Arnesen, J.W. Berton, S. Brau, P. Carter, L. Cervantes, C. Cramaine, P. Gadnason, N. Kauer, M.A. Larkin, K. Levenback, L. McCloud, D.A. Morse, G. Ortalea, V. Russell, J. Shapiro, E. Thomas
Jenny McKean *Moore Visiting Lecturer in Creative Writing* A. Baraka

Bachelor of Arts with a major in American literature or English literature (field-of-study or departmental)—The following requirements must be fulfilled:
1. The general requirements as stated on pages [illegible]. (Students should consult the departmental advisor regarding courses to be taken in satisfying the requirements for meaningful initiation into the social sciences and the natural and mathematical sciences.)
2. Prerequisite courses—Engl 51-52 or 61-62 or 71-72 or 191-92.
3. Required courses in related areas—(a) as appropriate, 3-12 semester hours, or mastery of level 4, of a foreign language (classical Hebrew, Greek, Latin, French, German, Italian, Russian, or Spanish); (b) six semester hours of philosophy and/or religion; (c) six semester hours of history (English, American, European, or world).
4. Required for the major:
(a) *Field-of-study major*—a major examination must be passed in either American or English literature at the end of the senior year. Although no set

Offered jointly by the Education Policy Program and the Sociology Department.

pattern of courses is prescribed, students are expected to engage themselves with writers and works from the whole chronological span of American literature or English literature. Proseminars in American Literature, Engl 199-200, and in English Literature, Engl 195-96, assist students in their preparation for the major examination. Students who wish to be candidates for graduation with Special Honors in either American or English literature must be in the field-of-study major.

(b) *Departmental major*—30 semester hours of second-group courses offering experience with several approaches to literature which, together, make a discipline of literary study, distributed as follows:

American literature major—Engl 120, 193, and either 161–62 or 163 and 167; three semester hours of English literature; and 15 additional hours of courses offered by the English Department, of which at least 12 hours must be in American literature.

English literature major—Engl 120, 193–94; three semester hours of American literature; and 18 additional hours of courses offered by the English Department, of which at least 15 hours must be in English literature.

Master of Arts in the field of American literature—Prerequisite: the degree of Bachelor of Arts with an undergraduate major in English or 24 semester hours in English and/or American literature above the sophomore level.

Required: the general requirements, pages 88–90, including (1) 24 semester hours of course work planned in consultation with the advisor on the basis of the student's undergraduate preparation, including a minimum of six semester hours in English literature, (2) a written Master's Comprehensive Examination, (3) a master's thesis (six semester hours) written on an approved topic under the direction of the instructor in whose field the major portion of the material falls, or, with the approval of the department advisor, 12 additional semester hours in lieu of thesis.

Master of Arts in the field of English literature—Prerequisite: the degree of Bachelor of Arts with an undergraduate major in English or American literature, or 24 semester hours in English and/or American literature above the sophomore level.

Required: the general requirements, pages 88–90, including (1) 24 semester hours of course work planned in consultation with the advisor, (2) a written Master's Comprehensive Examination, and (3) a master's thesis (six semester hours) written on an approved topic under the direction of the instructor in whose field the material falls, or, with the approval of the department advisor, 12 additional semester hours in lieu of thesis.

Doctor of Philosophy in the field of American literature—Required: the general requirements, pages 90–91, 97–99; high-level proficiency in an appropriate foreign language; the passing of a General Examination in the following four fields: (1) Early American literature—to 1815, (2) 1815–1900, (3) 1900 to present, (4) a fourth field, which may be either literary or interdisciplinary. Each student plans a program in consultation with a departmental committee.

Doctor of Philosophy in the field of English literature—Required: the general requirements, pages 88–91, 97–99; high-level proficiency in an appropriate foreign language; the passing of a General Examination in four of the eight following fields: (1) beginnings to 1500, linguistics, and history of the language, (2) 1500–1660, (3) 1660–1800, (4) 1800–1900, (5) 1900 to present; (6) drama, including Shakespeare; (7) criticism; (8) American literature—one of the first three fields listed above under "Doctor of Philosophy in the field of American literature." Each student plans a program in consultation with a departmental committee.

Bachelor of Arts in Education with a teaching field in English—Prerequisite: the education curriculum, pages 111–12.

Required: the English option and the professional courses listed on pages 115–16.

Students whose College Board English Composition Achievement Test scores suggest inadequate preparation may be assigned to Engl 9 or may be tested in vocabulary, reading, spelling, grammar, standard usage, and writing skill, before placement in either Engl 9 or 10. Students whose scores or writing skill indicate superior competence will be allowed to waive Engl 10; those whose scores indicate markedly superior competence will be allowed to waive both Engl 10 and Engl 11 or 12.

The admission of international students to any English course is determined by the English Placement Test for Foreign Students. Students should apply to the office of English for International Students to take this test (see page 21). Course listings in the English as a Foreign Language Program are shown in the *College of General Studies Bulletin*.

Departmental prerequisite: Engl 9 or 10 is prerequisite to all other courses in English. A 6-semester-hour course in literature, or equivalent, or written permission of the instructor, is prerequisite for admission to all second-group courses in English except Engl 115, 160–61–62, and 191–92.

ENGLISH COMPOSITION

First Group

9 English Composition: Language as Communication (3) — Claeyssens and Staff

Intensive grammar and composition course for students inadequately prepared for Engl 10. Detailed instruction, drill, and exercises in basic structure and writing paragraphs; also includes content covered in Engl 10. In addition a noncredit reading course, given by the Reading Center, is required for students whose test scores show a reading deficiency. Engl 9 meets five hours per week and carries three semester hours of credit; the reading course meets an additional three hours per week for a maximum of 10 weeks. Special fee, $25. **(Fall and spring)**

10 English Composition: Language as Communication (3) — Claeyssens and Staff

Study and practice of expository techniques; emphasis on the rhetorical complexities of unity, development, organization, and coherence, by analysis of selected current prose; library research procedure. **(Fall and spring)**

11 English Composition: Language and the Arts and Sciences (3) — Claeyssens and Staff

Study and practice of expository and argumentative techniques; emphasis on the rhetorical complexities of the sentence and diction, and on logical thought, by analysis of selected readings on the nature of language and of the arts and sciences. Prerequisite: Engl 9 or 10. Students who receive credit for Engl 11 cannot receive credit for Engl 12. **(Fall and spring)**

12 **English Composition: Language in Literature** (3) — Claeyssens and Staff

Study and practice of expository and argumentative techniques through critical writing; emphasis on the rhetorical complexities of stylistics in the sentence and diction and on logical thought, by the study of literary genres and of the use of language in literature. Prerequisite: Engl 9 or 10. Students who receive credit for Engl 12 cannot receive credit for Engl 11. (Fall and spring)

50 **English Composition/Research Methods for International Students** (3) — Bozzini and Staff

An advanced-level composition course for international students showing a high degree of academic proficiency in English. Four class hours per week. Special fee, $25

Second Group

101 **Expository Writing** (3) — Claeyssens and Staff

Types of expository writing; weekly exercises based on students' needs; particular attention may be given to problems in the writing of graduate theses. Prerequisite: Engl 9 or 10; 11 or 12. (Fall and spring)

102 **Introduction to Creative Writing** (3) — McAleavey

Discussion of student poetry and/or prose fiction. Prerequisite: Engl 9 or 10; 11 or 12; consent of instructor. The student should submit a writing sample to the instructor before registration. (Fall and spring)

103 **The Writing of Fiction—the Short Story** (3) — McAleavey

Prerequisite: Engl 102; consent of instructor. The student should submit a writing sample to the instructor before registration. (Fall)

104 **The Writing of Poetry** (3) — McAleavey

Prerequisite: Engl 102; consent of instructor. The student should submit a writing sample to the instructor before registration. (Spring)

105–6 **The Writing of Plays** (3–3) — Claeyssens

Same as SpDr 105-6. Prerequisite: Engl 9 or 10; 11 or 12; consent of instructor. The student should submit a writing sample to the instructor before registration. (Academic year)

107 **The Writing of Fiction—the Novel** (3) — Claeyssens

Prerequisite: Engl 102 or 103; consent of instructor. The student should submit a writing sample to the instructor before registration.

108 **Advanced Creative Writing** (3) — McAleavey

Prerequisite: Engl 102; consent of instructor. The student should submit a writing sample to the instructor before registration. (Fall)

Third Group

201–2 **The Teaching of Composition** (3–3) — Claeyssens and Staff

(Academic year)

ENGLISH LITERATURE

First Group

51–52 **Introduction to English Literature** (3–3) Rutledge and Staff
Representative works by major authors studied in their historical context: discussion of recurrent themes, and introduction to various types and forms of imaginative literature. (Academic year)

61 **Tragedy** (3) Carter
(Formerly Engl 62)
Modes of tragedy as developed in drama, nondramatic verse, and prose fiction in literature from ancient to modern times—Book of Job to Beckett. (Fall)

62 **Comedy** (3) Paster
(Formerly Engl 61)
Modes of comedy as developed in drama, nondramatic verse, and prose fiction—Chaucer to Borges. (Spring)

Second Group

111 **Medieval English Literature—Exclusive of Chaucer** (3) Allee

112 **Chaucer** (3) Allee
(Spring)

115 **Introduction to English Linguistics** (3) Allee
Development of the English language in a historical treatment of English grammar.

116 **Medieval Legend and Saga** (3) Allee
Celtic and Norse.

117–18 **English Poetry: Form and Content** (3–3) Welsmiller
Traditional and modern poetry; emphasis on the ordering of language by which poetry brings into being patterns of thought and feeling which release meaning.

120 **Practical Criticism** (3) Plotz
Uses of language and complex shapes of thought in literature; introduction to mature study and full enjoyment of poetry, fiction and drama. (Fall and spring)

123 **Principles of Literary Criticism** (3) Carter
Works of major critics; consideration of ways in which literature is analyzed, classified, judged and defined: Aristotle, Longinus, Dryden, Johnson, Coleridge, Schiller, Arnold, Eliot, Richards, Frye.

125–26 **Elizabethan Verse and Prose** (3–3) Quitslund
(Engl 125—fall)

127–28 **Shakespeare** (3–3) Highfill
Development of dramatic forms and recurrent themes. Engl 127: histories and comedies. Engl 128: tragedies. (Academic year)

129 **The Earlier 17th Century** (3) Quitslund
Poetry and prose to 1660, exclusive of Milton. (Spring)

130 Milton (3) Reesing

131–32 English Literature, 1660-1780 (3–3) Highfill

Poetry and prose of the Neoclassic period. Engl 131: 1660–1740. Engl 132: 1740–1780.

133–34 The Romantic Movement (3–3) Plotz

Engl 133: Blake, Wordsworth, Coleridge. Engl 134: Byron, Shelley, Keats.

135–36 Victorian Literature (3–3) Carter

Engl 135: Tennyson, Browning, Arnold, Dickens; Carlyle, Ruskin. Engl 136: George Eliot, Browning, Tennyson, Swinburne, Hardy, Hopkins, Wilde, Pater. (Academic year)

137–38 The 20th Century (3–3) Linton

Literature since 1900. Engl 137: poetry and criticism. Engl 138: drama and the novel. (Academic year)

145–46 Special Topics in English Literature (3–3) Carter, Plotz

Engl 145: Freud, Shakespeare, and Dostoevsky. Engl 146: Romantic visions of childhood. Each course may be repeated for credit. (Academic year)

147–48 Special Topics in English Literature (3–3) Maddox

Engl 147: Irish literature in the 20th century, with special emphasis on Joyce and Yeats. Each course may be repeated for credit. (Fall)

149 The Romantic Movement (3) Combs

Poetry and prose, 1780-1830. Students who receive credit for Engl 149 cannot receive credit for Engl 133 or 134. (Fall)

151 19th-Century British Poetry (3) Staff

Readings in Wordsworth, Keats, Browning, and Swinburne.

153–54 The English Novel (3–3) Maddox

Major novelists. Engl 153: 18th century. Engl 154: 19th century. (Academic year)

155–56 The English Drama (3–3) Paster, Highfill

Engl 155: Shakespeare's contemporaries. Engl 156: Historical survey, 1660 to present. (Academic year)

157 20th-Century Drama (3)

Representative continental, English, and American plays of the 20th century.

158 20th-Century British Prose Fiction (3)

191–92 Introduction to European Literature (3–3) Seavey

Selected major works in various genres, read in translation and in entirety. Engl 191: *Iliad* and *Aeneid*, dramas from ancient to modern times. Engl 192: Plato, Ovid, and Dante; medieval saga and romance; prose fiction from Cervantes to Mann. Open to freshmen and sophomores. May be taken to satisfy the requirement for meaningful initiation into the humanities. (Academic year)

193–94 History of English Literature (3–3) Reesing

(Academic year)

195–96 **Proseminar in English Literature** (3–3) Paster
For field of study majors in English literature. Themes and concerns basic to the English literary tradition, which draw connections between diverse works from the Old English period to recent times. (Academic year)

197 **Independent Study** (3) Reesing and Staff
Open to honors candidates in the field-of-study major in English literature during their senior year. (Fall and spring)

198 **Senior Honors Thesis** (3) Ganz and Staff
Independent study. Under the guidance of an instructor, the student writes a thesis on an approved topic. Open to qualified seniors in the field-of-study major in English literature. (Fall and spring)

Third Group

212 **Studies in Chaucer** (3) Allee

213 **Old English** (3) Allee
Old English grammar and readings.

214 **Beowulf** (3) Allee
Prerequisite: Engl 213 or equivalent.

217 **English Poetry: The Formal Development** (3) Weismiller

218 **Form and Content in Modern Poetry** (3) Weismiller

219 **Research Methods and Bibliographical Materials** (3) Broderick
Principal bibliographical sources and typical problems in research. (Fall)

223–24 **Studies in Literary Criticism** (3–3) Plotz

225–26 **Studies in 16th-Century English Literature** (3–3) Quitslund
(Engl 226—spring)

227–28 **Studies in Shakespeare and his Contemporaries** (3–3) Paster

229 **Studies in English Literature, 1600-1660** (3) Reesing
Chief figures exclusive of Milton

230 **Studies in Milton** (3) Reesing

231–32 **Studies in English Literature, 1660–1780** (3–3) Highfill
(Academic year)

233–34 **Studies in the Romantic Movement** (3–3) Plotz
(Academic year)

235–36 **Studies in Victorian Literature** (3–3) Carter

237–38 **Studies in 20th-Century Literature** (3–3) Linton

253–54 **Seminar: The English Novel** (3–3) Maddox

255–56 **Studies in Dramatic and Theatrical History** (3–3) Highfill
Engl 256, Seminar in drama and theater of the Restoration and 18th century, held among the Folger Library collections. A Folger Institute Seminar.

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

Fourth Group

George Washington University is a member of the Folger Institute of Renaissance and 18th-century Studies. Institute policies are set by a central committee on which each member institution is represented. Doctoral students enrolled in one of the Institute seminars are eligible to apply for fellowship aid. Folger Institute Seminars are numbered 301 through 308. Students wishing to register for these courses should consult the chairman of the English Department.

301–308 **Folger Institute Seminars** (3 credits each) Staff
Topics will be announced.

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

AMERICAN LITERATURE

First Group

71–72 **Introduction to American Literature** (3–3) Ganz and Staff
Historical survey. Engl 71: From beginnings to the Civil War. Engl 72: From the Civil War to present. (Academic year)

Second Group

120 **Practical Criticism** (3) Plotz
Uses of language and complex shapes of thought in literature: introduction to mature study and full enjoyment of poetry, fiction, and drama. (Fall and spring)

160-61-62 **Studies in American Literature** (3–3–3) Seavey, Sten
Same as AmCx 160-61-62. Major factors in the national culture and tradition as shown by outstanding writers. (Engl 160, 162—fall; 161—spring)

163–64 **Major American Poets** (3–3) Ganz
Advanced critical study of significant writers and movements. Engl 163: From beginnings through the 19th century. Engl 164: The 20th century. (Academic year)

165–66 **American Drama** (3–3) Combs, Claeyssens
Historical and critical study of significant plays and forms. Engl 165: From beginnings to 1930. Engl 166: Since 1930. (Academic year)

167–68 **The American Novel** (3–3) Sten, Maddox
Historical and critical study of significant novels. Engl 167: From beginnings through the 19th century. Engl 168: The 20th century. (Academic year)

170 **The American Short Story** (3) Combs
Historical development of the American short story. (Spring)

171–72 **Major American Writers** (3–3)

173–74 **Selected Literary Movements** (3–3) McAleavey
Engl 174: Fictions per se—a study of fabulist prose fiction, focusing on storytelling, fabrication, and make-believe; readings from Poe, Kafka, Borges, Coover, Wildman, Pynchon, Katz, Barthelme, Marquez, Cortazar. Each course may be repeated for credit. (Spring)

175–76 **Special Topics in American Literature** (3–3) Claeyssens, Paster
Engl 175: Autobiography as literature. Engl 176: The city in English and American literature. Each course may be repeated for credit. (Academic year)

177–78 **Contemporary American Literature** (3–3) Ganz, Claeyssens
Major and representative works since World War II. (Academic year)

181–82 **TBA** **TBA**
Two special courses offered each year by the Jenny McKean Moore Visiting Lecturer in Creative Writing. Each course may be repeated for credit. (Academic year)

197 **Independent Study** (3) Reesing and Staff
Open to honors candidates in the field-of-study major in American literature during their senior year. (Fall and spring)

198 **Senior Honors Thesis** (3) Ganz and Staff
Independent study. Under the guidance of an instructor, the student writes a thesis on an approved topic. Open to qualified seniors in the field-of-study major in American literature. (Fall and spring)

199–200 **Proseminar in American Literature** (3–3) Sten
For field-of-study majors in American literature. Readings, conferences, and group discussions. (Academic year)

Third Group

219 **Research Methods and Bibliographical Materials** (3) Broderick
Principal bibliographical sources and typical problems in research. (Fall)

263–64 **Studies in American Poetry** (3–3) Ganz
(Engl 264—fall)

267–68 **Seminar: American Fiction** (3–3) Maddox
Research and critical reading: fiction and the criticism of fiction. (Engl 267—fall)

281–82 **Seminar: Early American Literature** (3–3) Seavey
(Engl 281—spring)

283–84 **Studies in American Romanticism** (3–3) Broderick
Engl 283: Melville—the early fiction. Engl 284: Emerson, Thoreau, and the Concord Group: the intellectual background and the literary achievement. (Engl 283—spring)

285–86 **Seminar: American Literature, 1865-1900** (3–3)
Realism in America. Staff

299–300 **Thesis Research** (3–3)
(Fall and spring)

Fourth Group

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

ENVIRONMENTAL STUDIES

Committee on Environmental Studies

A.K. Fitzsimmons *(Chairman)*, O. Bergmann, R.S. French, R.W. Kenny, R.C. Lindholm, H. Merchant, W.E. Schmidt, A.M. Yezer

Columbian College of Arts and Sciences offers interdepartmental programs in environmental studies leading to the degree of Bachelor of Arts or Bachelor of Science. The program leading to the degree of Bachelor of Arts is designed for the student who is oriented toward participating in environmental decision-making with emphasis on the perspective of the social sciences. The program leading to the degree of Bachelor of Science is designed for the student with well-developed interests in science who seeks professional identification as a field or laboratory worker in the environmental sciences.

Bachelor of Arts with a major in environmental studies (departmental)—The following requirements must be fulfilled:

1. The general requirements as stated on pages 72–73, 79–85.

2. Prerequisite courses (qualified students may substitute advanced courses with departmental permission, in order to include more elective courses in their program):

(a) **Statistics—Stat 91.**

(b) Natural sciences—six to eight semester hours selected from BiSc 3–4, 11–12; Chem 11–12; Geol 1–2, 21–22; or Phys 1, 2. Courses designated for non-science majors must be passed with a grade of *A* or *B* to be accepted toward fulfilling the introductory natural science requirement. This includes BiSc 3–4 and Geol 1–2.

(c) Social studies—12 semester hours selected from Anth 1–2; Econ 1–2; Geog 51, 52; PSc 1 or 3, 2; Psyc 1, 5–6; or Soc 1, 2.

3. Required courses in the major (48 semester hours):

(a) **BiSc 140 (four semester hours).**

(b) Eight semester hours selected from BiSc 101, 102, 103, 108, 109, 110, 111, 115, 118, 123, 124, 125, 127, 135, 141, 143, 144, 145, 146, 149, 150, 161, 167, 188, 208, 210, 211, 237, 242; Chem 22, 50, 122, 151–52, 153–54; Geol 5, 105, 125, 126, 141, 163, 181, 272; Phys 6, 14, 15, 16, 27–28.

(c) 30 semester hours in courses selected from two departments in the following—Anth 151, 152, 171, 186, 187, 188, 263, 267; Econ 101, 102, 136, 157, 158, 161, 199, 237; Geog 106, 127, 132, 134, 135, 140, 142, 144, 145, 221, 222, PS, 111, 112, 117, 118, 120, 122, 187; Psyc 104, 144, 151, 156; Soc 126, 127, 128, 150, 152, 181.

(d) **Envr 151–52 (six semester hours).**

Bachelor of Science with a major in environmental studies (departmental)—The following requirements must be fulfilled:

1. **The general requirements as stated on pages 72–73, 79–85.**

2. Prerequisite courses (qualified students may substitute advanced courses with departmental permission, in order to include more elective courses in their program):

(a) Statistics—Stat 91.

(b) Natural sciences—12 to 16 semester hours selected from BiSc 11–12; Chem 11–12; Geol 21–22; Phys 1, 2. Either BiSc 11–12 or Chem 11–12 must be selected.

(c) Social studies—12 semester hours selected from Anth 1–2; Econ 1–2; Geog 51, **52; PSc 1 or 3, 2; Psyc 1, 5–6; Soc. 1, 2.**

3. **Required courses for the major (48 semester hours):**

(a) BISc 140 (four semester hours).

(b) 20 semester hours selected from BiSc 101, 102, 103, 108, 109, 110, 111, 115, 118, 123, 124, 125, 127, 135, 141, 143, 144, 145, 146, 149, 150, 161, 167, 185, 208, 210, 211, 237, 242; Chem 22, 50, 122, 151–52, 153–54; Geol 5, 105, 125, 128, 141, 163, **181, 272; Phys 6, 14, 15, 16, 27–28.**

(c) 18 semester hours selected from Anth 151, 152, 171, 186, 187, 188, 263, 267; Econ 101, 102, 136, 157, 158, 161, 199, 237, Geog 106, 127, 132, 134, 135, 140, 142, 144, 145, 221, 222, PSc 104, 111, 112, 117, 118, 120, 122, 187, Psyc 104, 144, 151, 156; **Soc 126, 127, 128, 151, 152, 181.**

(d) Envr 151–52 (six semester hours).

The science and social science courses listed under 3(b) and 3(c) above must be taken in not more than *three* departments. Not more than six hours of service-learning courses may count toward fulfilling requirements of the major.

In choosing elective courses for both the Bachelor of Arts and Bachelor of Science degree programs, students are reminded that permission of the Dean of Columbian College of Arts and Sciences and the Committee on Environmental Studies is necessary to take courses not offered by Columbian College of Arts and Sciences, and that a maximum of 12 semester hours of such courses may be taken. The following may be of interest to the environmental studies major: BAd **101, 171, 201, 203; *CE 194, 197; HKLS 152; U&RP 153, 201, 205.** The permission of the instructor, the department chairman, and the Dean of the School of Government and Business Administration is necessary to take graduate courses [numbered 201 and above] in that School.

151–52 Senior Seminar in Environmental Studies (3–3) Staff

Limited to majors in environmental studies. Directed reading and discussion of contemporary environmental problems.

157 Introduction to Environmental Law (3)

An introduction to selected pieces of major environmental legislation. The role of the courts and bureaucracy in implementing and interpreting legislation. Impact on decision-making. Designed for **students with no training in law.**

158 Special Topics in Environmental Law (3)

Analysis of environmental laws which focus on a particular environmental issue. Topics will vary. Prerequisite: Envr 157 or permission **of instructor.**

159–60 Field Experience (3–3)

Open to juniors and seniors majoring in environmental studies. Students will spend at least eight hours per week in a political, technical, legal, or special interest organization working on environmental **questions.**

*See the *School of Engineering and Applied Science Bulletin* for civil engineering courses.

EXPERIMENTAL HUMANITIES*

Associate Professors R.S. French *(Director)*
Adjunct Associate Professor L.J. Lear
Faculty Associate D.J. Lynn
Adjunct Instructor P.E. Wallace, Jr.

EXPERIMENTAL HUMANITIES

First Group

2–3 **Politics and Values** (3–3) Staff

A freshman course; limited enrollment. Students will be housed in Thurston Hall. Field-study and case-study of value conflicts implicit in selected political issues involving federal policy and legislation. Concurrent registration in special sections of PSc 2 and 3 required. Students registering for Hum 2 in the fall semester will be required to register for Hum 3 in the spring semester. Admission by permission of instructor. (Fall and spring)

†26 **Environmental Issues** (3) French, Fitzsimmons, Merchant

An interdisciplinary analysis of selected aspects of the population question, pollution and human health, urban environmental problems, issues of economic growth and development, technology and public policy. (Spring)

40 **Washington, D.C.: Culture and Politics** (3) Lear and Interdisciplinary Team

An all-university course designed primarily for freshmen and transfer students. Major facets of metropolitan life, past and present, analyzed by faculty, students, and community leaders. (Fall)

91–92 **The Creative Process** (3–3) Claeyssens and Interdisciplinary Team

The process of invention in the fine and popular arts is studied in Hum 91 through exchanges with practicing artists at their rehearsals and studios and through class discussions with visiting artists and critics. Examination of documents in which artists in various fields discuss work in progress. Professors of drama, dance, film, art, and English participate. Enrollment in Hum 92 is limited to students living in Building JJ, a small coeducational residence hall reserved for members of this class who are approved by the instructor for independent study projects. (Academic year)

Second Group

101–2 **Supervised Field Study** (6–6) French

Community-based projects supervised by appropriate faculty. Juniors and seniors admitted by permission of instructor. Prerequisite to Hum 102: Hum 101. (Hum 101 and 102—fall and spring)

171 **The Legal Process** (3) Wallace

The function which law plays in society and the nature of the legal process. Examination of the societal assumptions and values that

* Administered by the Division of Experimental Programs.
† Offered jointly by the Division of Experimental Programs and the Departments of Biological Sciences and Geography and Regional Science.

mold the law. Emphasis upon institutions that make up the law—the courts, administrative agencies, legislative bodies, and executive agencies. Open only to juniors and seniors by permission of instructor. (Academic year)

174 **Science and Values** (1 or 3) Schmidt, Parke

Study of the effects of scientific knowledge and technology on social institutions and the image of man, of the question of ethics and morality in science, and of the science of values. Admission by permission of instructor.

198 **Conference on Policy Studies and the Humanities** (3) Lynn
(Formerly 3 or 6 credits)

Examination of a selected policy issue (e.g., health care, freedom of information, drug abuse) in relation to alternative social goals. Open to graduate, law, and medical students, as well as advanced undergraduates by permission of instructors.

SERVICE-LEARNING EXPERIMENTAL HUMANITIES

See **Service-Learning Program.**

FORENSIC SCIENCES—GRADUATE PROGRAMS

Professors T.P. Perros, J.E. Starrs, T.F. Courtless, Jr., C. O'Rear *(Chairman)*
Professorial Lecturers B.J. White, C.B. Cunningham
Adjunct Professor C.G. McWright
Associate Professorial Lecturers D.D. Garner, J.T. Smith, J.T. Wieseman, G.M. Saiger, R.S. Bennett, E.G. Howe, C.E. Bohn, J.L. Melnick, K.E. Melson, J.D. Kogan
Assistant Professors N.T. Lappas, W.F. Rowe
Assistant Professorial Lecturers C. Smiley, H.F. Schuelke III, L.H. Wechsler, J.P. Hume, N.R. Janis, M. Stajic, J.L. Lyons, A.J. Graham, G.M. Richman, R.I. Richter, E.D. Ross, Jr.

Master of Forensic Sciences.–Prerequisite: a bachelor's or a graduate degree from an accredited institution of higher learning and academic or professional experience in the behavioral, biological, or physical sciences, or law, medicine, or law enforcement.

Required: the general requirements, pages 88–96. For students not electing a thesis, 36 semester hours of course work are required; for students electing a thesis, 30 semester hours of course work, plus a thesis (equivalent to six semester hours), are required. ForS 220, 221, 224, and 225 are required of all students. ForS 224 may be waived for students having an LL.B. or J.D. degree from an accredited law school. The following are also required: (1) nine hours selected from ForS 201, 202, 203, 204, and 205; (2) nine hours selected from ForS 214, 260, 261, 265, and 269; (3) the remaining semester hours must be selected in consultation with the advisor from the behavioral sciences, law, management science, or forensic sciences. It is strongly recommended that students participate in the internship program. All candidates are required to pass a written Master's Comprehensive Examination. There is no tool requirement.

Master of Science in Forensic Science—Prerequisite: a bachelor's or graduate degree in the biological or physical sciences from an accredited college or university.

Required: the general requirements, pages 88-96. The program of study consists of 30 semester hours of course work, plus a thesis (equivalent to six semester hours). Individualized programs of study will be developed to meet the career objectives of each student. Students may specialize in forensic chemistry, toxicology, or serology. Each such program of study must include ForS 224 and 225. All candidates must also participate in the departmental seminar each semester. The remaining semester hours must be selected from approved courses in the forensic sciences, biological and physical sciences, management science, law, or basic medical sciences. It is strongly recommended that students participate in the internship program. All candidates are required to pass a written Master's Comprehensive Examination. Candidates must also fulfill the tool requirement by passing a reading knowledge examination in French, German, or Russian, or by satisfactorily completing the tool requirement in either statistics or computer programming.

Master of Arts in Special Studies—Prerequisite: a bachelor's or graduate degree from an accredited college or university.

Required: the general requirements, pages 88-96. The program of study consists of 36 semester hours of approved course work drawing upon the forensic sciences, law, criminology, management science, sociology, and psychology. ForS 220, 221, 224, 225, 228, 254, 265, 266; Soc 259, 261, 262; PAd 223; and Mgt 201 are recommended. All candidates are required to pass a written Master's Comprehensive Examination. There is no tool requirement.

The interdisciplinary programs leading to the degrees of Master of Forensic Sciences and Master of Science in Forensic Science may include course work from the School of Government and Business Administration, from the National Law Center, from the School of Medicine and Health Sciences, and graduate course work in the behavioral, biological, and physical science departments of the University. Students work closely with their advisors in setting up a program that meets their interests, needs, and background knowledge. The Department of Forensic Sciences is affiliated with the Armed Forces Institute of Pathology in a program of mutual exchange among students, courses, and facilities. For further information, contact the Department of Forensic Sciences.

201 **Forensic Serology I** (3) Lappas

Principles of the forensic analysis of blood and other biological materials. Specific procedures and techniques used in forensic serology.

202 **Instrumental Analysis** (3) Perros, Rowe

Principles and application of various instrumental methods to the examination of criminal evidence, including chromatographic and spectrophometric techniques and mass spectrometry. Laboratory exercises.

203 **Examination of Questioned Documents** (3) Bohn

Theory and principles of handwriting and handprinting, duplicating processes, paper manufacture and fiber analysis; studies of paper and methods of examining questioned documents. Laboratory exercises.

204 **Firearms and Tool-mark Identification** (3) Cunningham, Rowe

Methods for identifying firearms, cartridge casings, tool-marks, tire marks, and footprints. Laboratory exercises.

205 **Personal Identification** (3) Given, Thompson

Methods of personal identification based on sketches, fingerprints, voiceprints, odontology, and study of skeletal remains.

214 **Forensic Psychiatry** (3) Howe, Saiger, Smith

Introduction to the constructs of dynamic psychiatry, psychiatric treatment, and the nomenclature of mental disorders. Consideration of expert testimony, direct examination, and cross-examination in hospitalization and criminal cases.

220 **Physical Aspects of Forensic Sciences** (3) Given, O'Rear, Rowe
(Formerly Introduction to Forensic Science)

Survey of forensic physical sciences: fingerprints, firearm and tool-mark examinations, document examinations, and examinations of trace evidence such as glass, soil, paint, hairs, and fibers; crime scene investigations; qualifications and preparation of expert witnesses; operation and functioning of the forensic science laboratory.

221 **Biological Aspects of Forensic Sciences** (3) Lappas, Stajic

Principles of forensic pathology, serology, and toxicology. The role of the forensic laboratory in the identification of human remains; determination of the time, cause, and manner of death; partial individualization of biological materials; and the detection of drugs in biological materials.

224 **Criminal Law I** (3) Starrs, Hume, Bennett, Wieseman

Principles of criminal law and procedure, preparation and presentation of evidence, examination of witnesses, and methods of legal research.

225 **Criminal Law II: Evidence** (3) Bennett, Melson

Procedural rules affecting the collection and use of physical evidence. Emphasis on court opinions defining the rules of search and seizure and admissibility of evidence. Prerequisite: ForS 224.

227 **Criminal Law III: Procedure** (3) Schuelke, Wechsler

Decision to arrest, prosecutive discretion, bail, the preliminary hearing, right to a speedy trial, discovery, plea bargaining, publicity, post-conviction procedures. Prerequisite: ForS 224.

228 **Administration of Criminal Justice** (3) Janis

Consideration and analysis of selected advanced problems in the administration of criminal justice. Emphasis on the role and professional responsibilities of prosecutor and defense counsel and on developmental trends in the law. Prerequisite: ForS 224.

250 **Interdisciplinary Aspects of Forensic Science** (3) Starrs

Scientific and legal aspects of current concepts. Includes qualification as an expert witness, chain of custody, impact of testimony on the jury, admissibility of evidence, class evidence vs individualized evidence, and search and seizure. Prerequisite: ForS 224.

251 **Moot Court** (3) Janis, Kogan

Students will prepare and present direct testimony and be cross examined by an experienced trial attorney in simulated courtroom setting. Class discussions of problems, techniques. Lectures on discovery, admissibility of scientific evidence, chain of custody, use of notes, etc. Prerequisite: ForS 224.

254 **Selected Topics in the Forensic Sciences** (3) Staff

Current issues in research, investigation, and law.

260 **Principles of Forensic Medicine** (3) Dixon, Thompson

Anatomy and physiology of the human body with emphasis on understanding the processes underlying traumatic and unexpected deaths encountered in forensic pathology. Bone growth and repair as it relates to child abuse, structure and functions of the heart relating to sudden death, and anatomic area of the brain prone to hemorrhagic lesions following trauma.

261 **Principles of Forensic Pathology** (3) Dixon, Thompson

Terminology and scientific techniques used in medico-legal investigations, sudden or unexpected deaths, homicides, suicides, accidental deaths, and trauma.

265 **Drugs of Abuse** (3) Lappas, O'Rear, Rowe

Chemical, pharmacological, toxicological, and pathological characteristics of commonly abused drugs, including ethanol, barbiturates, narcotics, stimulants, and hallucinogens. Primarily for M.A. in Sp.Std degree candidates; open to others with permission of instructor.

266 **Seminar: Modern Trends in Criminal Justice** (3) O'Rear

Recent advances in criminal justice. Discussions incorporate several disciplines including science, law, management, social sciences, and psychology.

268 **Photography in the Forensic Sciences** (3) Thompson

Basic use of forensic photography, including selection and use of equipment, photographs as evidence, close-up work, and common misconceptions. Laboratory fee, $25.

269 **Forensic Toxicology I** (3) Lappas

Relevant underlying biological, chemical, and pharmacological principles of forensic toxicology.

270 **Medicinal Chemistry** (3) O'Rear

Theory and principles of classification, synthesis, and structure activity relationships of drugs. Discussion of the complex chemical events that take place between administration of a drug and its action on the user, with emphasis on drugs of abuse.

271 **Forensic Serology II** (3) Lappas

Methods in forensic serology. Laboratory examinations and classifications of dried blood and other biological materials. Independent laboratory projects. Laboratory fee, $25. Prerequisite: ForS 201, or permission of instructor.

272 **Forensic Toxicology II** (3) Lappas

Lectures, student seminars, laboratory exercises, and projects dealing with topics of current interest in forensic toxicology. Prerequisite: ForS 269 or permission of instructor. Laboratory fee, $25.

273 **Forensic Chemistry I** (3) Rowe

Examination of glass, soils, hairs, and fibers. Laboratory exercises include refractive index measurements using immersion methods; polarized light observations of minerals, hairs, and fibers; elemental analysis of glass and soil by spectroscopic methods; x-ray diffraction analysis of minerals; and classical chemical and physical methods of analysis. Prerequisite: ForS 202 or permission of instructor. Laboratory fee, $25.

274 **Management of Criminal Justice Organizations** (3) O'Rear, White
(Formerly Forensic Laboratory Management)

Theories of management with emphasis on leadership. Interaction of individuals, groups, managers, and the organization as a whole. Discussions centered on the criminal justice system.

280 **Forensic Chemistry II** (3) **Rowe**

Examination of arson accelerants, textile fibers, plastics, and paints. Laboratory exercises include infrared spectrophotometry and pyrolysis—gas-liquid chromatography of polymeric materials, as well as classical chemical and physical methods of analysis. Prerequisite: ForS 273. Laboratory fee, $25.

295 **Research** (arr.) **Staff**

Open to qualified master's degree students. Research on problems approved by the department chairman or academic advisor, under the supervision of an appropriate staff member.

299–300 **Thesis Research** (3–3) **Staff**

(Fall and spring)

FRENCH

See **Romance Languages and Literatures.**

GENERAL CURRICULUM IN THE LIBERAL ARTS

Directed by the Curriculum Committee of Columbian College of Arts and Sciences

W.E. Schmidt *(Chairman)*, A.E. Claeyssens, J.A. Frey, M. Gordon, H.H. Hobbs, T.L. Hufford, R.W. Kenny, P.H.M. Lengermann, C.A. Moser, B. Reich, W.M. Reynolds, R.H. Shumway

The program is designed to provide a general education in the liberal arts, with or without a major, as the student chooses. It offers opportunity for achieving a substantial acquaintance with each of the three divisions of knowledge through a selection of courses that cultivate a broad perspective in time and in national and or cultural traditions. A Columbian College committee especially appointed to advise students in the program consists of one representative each from the humanities, the social sciences, and the natural and mathematical sciences.

Bachelor of Arts: General Curriculum in the Liberal Arts (departmental)—The following requirements must be fulfilled:

1. The general requirements as stated on pages 72–73, 79–85.
2. *Humanities*—39 semester hours:

(a) 6 semester hours selected from Engl 9 or 10, 11 or 12, 101.

(b) 18 semester hours (of which 6 semester hours must be in a foreign language) selected from Chin 163–64, Clas 71, 72, 108, 113, Engl 51–52, 61–62, 71–72, 127–28, 153–54, 155–56, 160 in combination with 161 or 162, 163–64, 165–66, 167–68, 170, 191–92; Fren 51–52, 60 in combination with 51 or 52, 91–92, Ger 51–52, 103–4, 111–12, 126, 161–62, Slav 91–92; Span 51–52, 91–92.

(c) 6 semester hours selected from Phil 111, 112, 113.

(d) 3 semester hours selected from Rel 9, 10, 21, 59, 60, 103, 104, 105, 107, 111, 113, 114, 115, 116, 126, 137, 143, 144, 145.

(e) 6 semester hours selected from Art 1, 31–32, 71–72, 101, 102, 103, 104, 105, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122,

140, 145, 147, 148, 149, 150, 155, 156, 161, 162, 165, 167, 169–70; Mus 3, 4, 7, 101–2, 103–4, 109, 110, 121, 125; SpDr 45, 49, 126, 143, 144, 165–66.

3. *Social Sciences*—18 semester hours:

(a) 6 semester hours selected from Hist 108, 109, 110, 111–12, 121, 122, 123–24, 171–72, 175–76, 179–80, 183.

(b) 6 semester hours selected from courses in economics; or 6 semester hours selected from courses in political science.

(c) 6 semester hours selected from courses in American civilization, anthropology, geography and regional science, psychology, or sociology.

4. *Natural and Mathematical Sciences*—22 semester hours:

(a) 8 semester hours in each of two laboratory sciences selected from BiSc 3–4 or 11–12; Chem 3–4 or 11–12; Geol 1–2 or 21–22, Phys 1–2 or 9–10.

(b) 6 semester hours selected from courses in mathematics (excluding Math 3 and 6).

5. *Electives*—41 semester hours of courses selected in consultation with the advisors.

A major is optional. If a student chooses a major, elective courses may be used to fulfill the requirements for it.

The requirement of 6 semester hours of literature in a foreign language may be fulfilled by selection from any of the first- or second-group foreign-language courses in literature. The requirement presupposes foreign-language competency, which a student may achieve, if necessary, through elective courses.

A student must pass a minimum of 45 semester hours of second-group courses. By passing an examination administered or authorized by the appropriate department, a student may waive introductory courses that are prerequisite to more advanced courses.

GENETICS—GRADUATE PROGRAMS

Committee on Genetics

S.O. Schiff *(Chairman)*, W.F. Anderson, D. Brusick, R. Crystal, R.F. De Giovanni-Donnelly, R.C. Gallo, D. Gillespie, C.B. Jacobson, D. Johnson, P.D. Kind, K. Krell, W.M. Leach, R. Mage, C.R. Merril, A. Mescher, W.G. Nash, S. O'Brien, J.C. Petricciani, D. Picciano, M. Schanfield, J. Schlom, K. Todaro

The Graduate School of Arts and Sciences offers an interdepartmental program leading to the degrees of Master of Science and Doctor of Philosophy in the field of genetics. This program is directed by a committee whose members are drawn from the Departments of Biochemistry, Biological Sciences, Child Health and Development, Microbiology, Obstetrics and Gynecology, and Pharmacology; and from four government agencies—the Bureau of Radiological Health, the National Institutes of Health, the National Institute of Mental Health and the Food and Drug Administration.

A baccalaureate degree and acceptable Graduate Record Examination scores are required for admission to the degree program. The undergraduate program must have included the following: eight semester hours each in biology, in organic chemistry and organic chemistry; six semester hours in physics; and six semester hours in English composition and literature. While not required for admission, courses in embryology, genetics, and mathematics are strongly recommended.

Master of Science in the field of genetics—Required: the general requirements, pages 88–96. The 30 semester hours required in this program must include Gnet 201–2 and Gnet 299–300. The remaining 20 semester hours of course work are to be selected, with the approval of the Committee on Genetics, from

the departmental courses listed below. The tool requirement may be met by satisfactorily completing an approved course in biostatistics or by passing a foreign language reading examination.

Doctor of Philosophy in the field of genetics—Required: the general requirements, pages 88–91, 97–99. The program of study must include Gnet 301-2, eight to 10 semester hours of biochemistry, six to eight semester hours of cell biology, 10 to 12 semester hours of genetics, and two or three semester hours of statistics. These courses may be selected from the departmental listings below. The tool requirement may be met by the satisfactory completion of an approved course in biostatistics and the passing of a foreign language reading examination, preferably in French or German.

GENETICS

Third Group

201–2 **Advanced Problems in Genetics** (2–2) **Staff**

Lectures and individual study with members of the Committee on Genetics. Required of all master's degree candidates in the field of genetics. (Academic year)

295 **Research** (arr.) **Staff**

Open to qualified master's degree students. Research on problems approved by the Committee on Genetics. May be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3) **Staff**

(Academic year)

Fourth Group

301–2 **Advanced Problems in Genetics** (2–2) Staff

Lectures and individual study with members of the Committee on Genetics. Required of all students preparing for the Doctor of Philosophy general examination whose field of study is genetics. (Academic year)

398 **Advanced Reading and Research** (arr.) Staff

Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.)

Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

ANATOMY

203 *Human Embryology* (1)
256 *Human Genetics* (1)
260 *Electron Microscopy in Cellular Biology—Lecture* (1)
261 *Transmission Electron Microscopy* (3)

BIOCHEMISTY

221–22 *General Biochemistry* (3–4)
223–24 *Biochemistry Laboratory* (1–1)

227 *Biochemistry Seminar* (1)
232 *Protein Chemistry I* (1)
233 *Protein Chemistry II* (1)
241 *Isotopes* (3)
266 *Biochemical Genetics and Inherited Metabolic Diseases* (1)

BIOLOGICAL SCIENCES

Biology

108 *Organic Evolution* (3)
111 *Introductory Microbiology* (4)
122 *Cell Biology* (3)
123 *Cell Biochemistry* (3)
124 *Cell Biochemistry Laboratory* (2)
127 *Genetics* (3)
128 *Genetics Laboratory* (1)
129 *Cell Physiology* (3)
130 *Cell Physiology Laboratory* (1)
138 *Advanced Genetics* (3)
167 *Radiation Biology* (3)
206 *Seminar: Radiation Biology* (3)
220 *Seminar: Cell Physiology* (3)
227 *Seminar: Genetics* (3)
228 *Population Genetics* (3)
229 *Cytogenetics* (3)
248 *Analysis of Development* (3)
249 *Seminar: Developmental Biology* (3)

Zoology

145 *Introduction to Vertebrate Embryology* (4)
146 *Experimental Developmental Biology* (4)

MICROBIOLOGY

211 *Microbiology* (4)
214 *Tissue Cell Culture and Somatic Variation* (3)
229 *Immunology* (3)
230 *Immunology Laboratory* (2)
231 *Immunobiology* (1)
233 *Virology* (3)
234 *Virology Laboratory* (2)
258 *Microbial Genetics* (2)
260 *Cellular Immunology* (1)

PHARMACOLOGY

203 *Fundamental Principles of Pharmacology* (3)
256 *Molecular Pharmacology* (2 or 3)
258 *Cancer Chemotherapy* (1)

STATISTICS

91 ***Principles of Statistical Methods*** **(3)**
117 ***Analysis of Variance*** **(3)**
127 ***Statistics for the Biological Sciences*** **(3)**
153–54 *Mathematical Models in Population Genetics* (3–3)

GEOGRAPHY AND REGIONAL SCIENCE

Professors M. Gordon *(Chairman)*, J.C. Lowe
Professorial Lecturers J.W. Nystrom, J. Baclawski, S. Baum
Associate Professor E.O. Pederson
Associate Professorial Lecturers P. True, E. Marasciulo
Assistant Professor A.K. Fitzsimmons
Assistant Professorial Lecturers D.E. Starsinic, J.F. Long, S.E.S. Mastran
Lecturer J. Fehrenbach

Bachelor of Arts with a major in geography (departmental)—The following **requirements must be fulfilled:**

1. **The general requirements as stated on pages 72–73, 79–85.**
2. Required courses in the major—30 semester hours of second-group geography and regional science courses, including Geog 105, to be chosen in consultation with **the undergraduate advisor.**

Master of Arts in the field of geography—Prerequisite: a Bachelor of Arts degree with a major in geography from this University, or an equivalent degree.

Required: the general requirements, pages 88–96. The minimum requirement consists of 30 semester hours of approved course work including a thesis; with the approval of the department, a student may elect a program of study without a thesis, but must then complete 36 hours of approved course work. A Master's Comprehensive Examination in three fields is required. Candidates must fulfill the tool requirement in one of three ways: (1) passing a reading knowledge examination in an approved foreign language, (2) satisfactorily completing six semester hours in statistics selected from Stat 105, 117, 118, 155, 159, 187, 188; or (3) satisfactorily completing Stat 106 and 110 (computer programming).

Bachelor of Arts in Education with a teaching field in geography—Prerequisite, **the education curriculum, pages 111–12.**

Required: the geography option and the professional courses listed on pages 115–16.

Master of Arts in Education with a field in elementary or secondary education (specializing in geography)—Prerequisite: a bachelor's degree with sufficient concentration in geography to permit successful pursuit of graduate study in the Department of Geography and Regional Science. Candidates must be accepted by **both the School of Education** and Human Development and the Department of Geography and Regional Science.

Required: the general requirements, pages 124–26, including 15 semester hours of graduate courses in geography and regional science.

First Group

3–4 **Introduction to Physical Geography** (3–3) Staff
Processes affecting the character of the physical components of the natural environment. Laboratory fee, $18 per semester. (Academic year)

*26 **Environmental Issues** (3) Staff
An interdisciplinary analysis of selected aspects of the population question, pollution and human health, urban environmental problems issues of economic growth and development, technology and public policy. (Spring)

51 **Introduction to Geography** (3) Staff
General survey of the systematic fields of human geography which play a role in the analysis and interpretation of man-environment relationships in both spatial and ecological contexts. (Fall, spring and summer)

52 **Introduction to Economic Geography** (3) Pederson
Examination of the basic principles which determine the location of economic activities. (Spring)

†91 **East Asia—Past and Present** (3) Johnson and Associated Faculty
An interdisciplinary course, introducing the student to a comprehensive and integrated understanding of the civilization and present problems of East Asia.

Second Group

104 **Special Techniques in Cartography** (3) Staff
Descriptive and statistical techniques for thematic mapping; computer cartography. Laboratory fee, $18. (Spring)

105 **Scope and Methods of Geography** (3) Pederson
Nature of geographical inquiry, approaches to the study of geography, empirical research methods. Admission by permission of instructor. (Spring)

106 **Introduction to Remote Sensing** (3) Staff
Examination of the principles and applications of remote sensing techniques using aerial photography and satellite imagery. Laboratory fee, $18. (Fall)

108 **Climatology** (3) Staff
(Formerly Geog 107 Weather and Climate)
Climatic elements and their controls; analysis of world climatic regions. (Spring)

110 **Geography of Desertification** (3) Staff
Man, climate, and change in arid regions. (Fall, alternate years)

125 **Transportation Geography** (3) Lowe
Consideration of the spatial aspects of interaction, diffusion, and information transfer including nodal activity and hierarchies, network geometry, gravity models, and diffusion processes. (Fall)

126 **Economic Geography** (3) Lowe
Theories concerning the location of economic activities. Exercises in locational analysis.

---

* Offered jointly by the Division of Experimental Programs and the Biological Sciences and Geography and Regional Science Departments.
† An interdepartmental course offered by the Geography and Regional Science, East Asian Languages and Literatures, Economics, History, Philosophy, Political Science, and Religion Departments.

127 **Population and Settlement** (3) Starsinic
Patterns of world population; factors contributing to population pressures, growth, and migrations. (Spring)

132 **Resource Management and Conservation** (3) Fitzsimmons
Principles and practices in effective utilization of resources in the United States and selected areas; public policies relating to conservation; environmental systems, perception, and impact studies. (Fall)

134 **Geography of Energy Resources** (3) Fitzsimmons
Analysis of regional patterns and trends in consumption and production of energy resources. Examination of international energy linkages and energy policies of selected nations. (Fall)

135 **Resources and Environmental Quality** (3) Fitzsimmons
Investigations into questions of resource use and environmental quality. Emphasis on public policy and societal attitudes as they influence man's use of resources. (Spring)

136 **Geography of Water Resources** (3) Staff
Analysis of the spatial patterns, development and use of water resources.

140 **Urban Geography** (3) **Pederson**
Analysis of the internal spatial structure of cities; emphasis on explaining patterns of location within the city. (Fall and summer)

141 **Urban Settlement** (3) **Pederson**
The location of cities, urbanization processes, theories and models of urban location and development.

142 **Urban Environments** (3) **Lowe**
Consideration of the climatic, hydrological, and other selected aspects of the physical geography of the city, as well as of the nature, organization, and spatial patterns of urban delivery systems. (Spring)

143 **Social Geography** (3) **Lowe**
Consideration of behavioral aspects of geography incorporating spatial cognition, spatial behavior, social space, migration processes, and conflicts in spatial decision-making. (Spring)

145 **Cultural Geography** (3) Fitzsimmons
Analysis of the relationships between culture and environment; emphasis on spatial and ecological considerations.

146 **Political Geography** (3) Pederson
Interrelationships among the human and physical environment and political systems; the organization of political territories. (Fall)

154 **Geography of the Middle East** (3) Staff
(Summer)

161 **Latin America** (3) **Gordon**
Examination of spatial characteristics of physical and cultural phenomena in Middle and South America. (Fall)

189–90 **Readings in Geography** (arr.) **Staff**
(Academic year)

198 **Topics** (3) — Staff
A consideration of geographic aspects of topical and future problems of society. Topics change each year. May be repeated for credit. (Spring)

199 **Practicum** (3) — Staff
Field work, internship or other controlled assignment with an agency or organization engaged in work in applied geography.

Third Group

*215 **Field Methods in Cultural Ecology: Settlement Patterns in Pre-Columbian Mesoamerica** (3 or 6) — Staff
Field and laboratory examination of settlement patterns and sociological structures in pre-Columbian Mesoamerica and their relationships to agricultural water-control systems.

221 **Seminar: Cultural Geography** (3) — Fitzsimmons
Study of the noneconomic processes which affect the location of human activity. Topics to be discussed are environmental perception and evaluation, social definitions of space, and diffusion of innovations.

222 **Seminar: Resources and the Environment** (3) — Fitzsimmons
Analysis of the spatial variations and interrelationships of resources and the environment. (Spring)

223 **Seminar: The Population-Food Balance** (3) — Gordon
Spatial problems associated with the dynamics and interaction of population growth and agricultural output. (Fall)

224 **Seminar: Political Geography** (3) — Pederson
Examination of the political factor in location theory and analysis of the nature of political territories.

225 **Seminar: Transportation Geography** (3) — Lowe
Analysis of human spatial interaction; emphasis on networks, graph theory, gravity, interaction and potential models, migration models and diffusion processes.

243 **Seminar: Urban Geography** (3) — Lowe
Functional processes affecting the evolving morphology and internal spatial patterns of urban phenomena; emphasis on economic factors behavioral considerations, and impact of time. (Fall)

244 **Seminar: Urban Systems** (3) — Pederson
Central place theory and other theories of urban location and the organization of systems of cities. (Spring)

261 **Seminar: Geography of Latin America** (3) — Marasciulo
Selected topics related to population, environment, and land use in Latin America. (Fall)

265 **Seminar: Geography of the Soviet Union** (3) — Baclawski
Physical features, economic geography, natural and energy resources.

* An interdepartmental course offered by the Geography and Regional Science and Anthropology Departments.

industries, transportation, agriculture, population trends, and borderland problems. (Spring)

266 **Seminar: Geographic Perspectives on Contemporary China** (3) True

China's development prospects: environmental constraints, population growth, and regional differences in context of Chinese cultural patterns and political organization. (Fall)

287 **Seminar: Problems in Latin American Civilization** (3) Staff

Interdisciplinary seminar; each student writes a report on some aspect of a selected key theme. May be repeated for credit. Admission by permission of instructor. (Fall and spring)

*290 **Principles of Demography** (3) Baum

Introduction to basic demographic perspectives and data; methods for analysis of population size, distribution, and composition; determinants and consequences of population trends. (Fall)

*291 **Methods of Demographic Analysis** (3) Long

Basic methods for analysis of mortality, natality, and migration; population estimates and projections; estimation of demographic measures from incomplete data. (Spring)

295 **Research** (arr.) Staff

May be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff

(Fall and spring)

GEOLOGY

Professors G. Teleki *(Emeritus)*, G.V. Carroll, F.R. Siegel *(Chairman)*, A.G. Coates, R.C. Lindholm, J.F. Lewis
Adjunct Professors J.W. Pierce, E.G. Kauffman, I.G. Sohn, M.A. Buzas
Professorial Lecturers N. Hotton, D. Appleman, I. Zietz
Associate Professorial Lecturers W.E. Maloney, A. Geiger, M.D. Turner, W. Back
Adjunct Assistant Professor G.C. Stephens
Assistant Professorial Lecturer F.J. Collier

Bachelor of Arts or Bachelor of Science with a major in geology (departmental)—The following requirements must be fulfilled:

1. The general requirements as stated on pages 72–73, 79–85.
2. Required introductory course—Geol 21–22.
3. Required courses in related areas (a) Chem 11–12; (b) Math 30 (for the degree of Bachelor of Arts) or Math 30 and 31 (for the degree of Bachelor of Science); (c) Stat 91; and (d) BiSc 11 or Phys 1 or 3 (for the degree Bachelor of Arts); BiSc 11, and Phys 1 or 3 (for the degree Bachelor of Science).
4. Required courses in the major—Geol 111, 112, 117, 118, 122, 123, 151–52 for both the degree of Bachelor of Arts and Bachelor of Science; Geol 128, 166, 189, 195 for the Bachelor of Science degree only.

Bachelor of Science with a major in geology—engineering option (engineering geology) (departmental)—An interdisciplinary curriculum offered by the

* An interdepartmental course offered by the Departments of Economics, Geography and Regional Science, Sociology, and Statistics.

Geology Department and the Civil, Mechanical, and Environmental Engineering Department in the School of Engineering and Applied Science. (Students wishing to work toward the degree of Bachelor of Science [Civil Engineering] with a geology option [geotechnical engineering] should consult the *School of Engineering and Applied Science Bulletin.*) The following requirements must be fulfilled:

1. The general requirements as stated on pages 72–73, 79–85.
2. Required introductory courses—ApSc 57, 58, 113; Chem 13; EE 51; Geol 21-22; Math 31, 32, 33; Phys 14, 16; or equivalents.
3. Required courses in the major: CE 120, 140, 166, 167, 168, 182, 185; Geol 111 12, 117, 118, 122, 136, 189, 195, and one course chosen from Geol 128, 141 or 163; Math 111, 112; ME 126, 131; Stat 91 or 102 or ApSc 115.

Master of Science in the field of geology—Prerequisite: the degree of Bachelor of Arts or Bachelor of Science with a major in geology from this University or an equivalent degree, and the Graduate Record Examination.

Required: the general requirements, pages 88–96. Master of Sciences degree candidates must include in their program of study Geol 141, 163, 205, and 2[illegible] Geol 299 300 *Thesis Research* is required. Candidates must pass a Master's Comprehensive Examination before submitting their thesis work. A reading knowledge examination in French, Spanish, German, or Russian must be passed before beginning the thesis work or before beginning the third semester of graduate work; other languages may be taken with permission of the department. With the permission of the department, candidates in the Master of Science program may substitute another approved tool subject in lieu of the foreign language requirement.

Master of Science in the field of geochemistry (an interdepartmental degree offered by the Departments of Geology and Chemistry)– Prerequisite: a Bachelor's degree with a major in geology or in chemistry from this University, or an equivalent degree.

Required: the general requirements, pages 88–96, including Chem 111–12; Geol 141, 241, 249; Chem 213; and Geol 299 300. The Master's Comprehensive Examination must be taken before registration for the second half of the thesis work. A reading knowledge examination in a foreign language, approved by the Departments of Geology or Chemistry, must be passed prior to beginning the third semester of graduate work or before beginning the thesis work, whichever occurs first.

Master of Science in the field of engineering geology—An interdisciplinary degree offered by the Geology Department and the Civil, Mechanical, and Environmental Engineering Department in the School of Engineering and Applied Science.

Prerequisite: A Bachelor of Science degree in geology or a Bachelor of Science (Civil Engineering) degree from this University or an equivalent degree which must include those courses or their equivalents as outlined for the undergraduate requirements in the field of geology with the engineering option (engineering geology). With the permission of the department, a student may elect a program of study consisting of 36 semester hours of approved course work without a thesis. (Students wishing to work toward a Master of Science in the field of geotechnics and foundation engineering should consult the *School of Engineering and Applied Science Bulletin.*)

Required: (a) The general requirements, pages 88–96; (b) geology—at least 12 semester hours to include Geol 128, 141, 163, and 205; (c) engineering and physical science –at least 12 semester hours to be selected from ApSc 211, 213; CE 204, 205, 206, 207, 208, 209, 216, 217, 218, 219, 221, 255, 256, 257, 263, 265, 27[illegible] 275, 276; ME 221, 227, 231, 261, 262; EngS 228.

Doctor of Philosophy in the field of geology—Required: the general requirements, pages 88–91, 97–99, including passing a reading knowledge examina[illegible]

tion in an approved foreign language and one other approved tool subject; and the satisfactory completion of the General Examination in three fields, one of which must be in petrology, stratigraphy, or structural geology.

Research fields: geomorphology, marine geology, mineralogy, paleontology, petrology, sedimentology, stratigraphy, structural geology, geochemistry, and hydrogeology.

Doctor of Philosophy in the field of geochemistry (an interdepartmental degree offered by the Geology and Chemistry Departments). Required: the general requirements, pages 88–91, 97–99, including passing a reading knowledge examination in an approved foreign language plus the satisfactory completion of Stat 117 and 118, or 91; and the satisfactory completion of the General Examination in four fields, including geochemistry and chemistry.

Bachelor of Arts in Education with a teaching field in earth science—Prerequisite: **the education curriculum, pages 111–12.**

Required: the earth science option and the professional courses listed on **pages 115–16.**

First Group

1–2 Introductory Geology for Nonscience Majors (3–3) Staff

An introduction, for nonscience majors, to the principle features of the composition, structure, and history of the earth. Topics include nature of minerals and rocks, physical processes, energy resources, continental drift, origin of life, and evolution. Lecture (2 hours), laboratory (2 hours). Laboratory fee, $15 per semester. **(Academic year)**

5 Environmental Geology (3) Siegel and Staff

The relation of people and society to natural environments, population evolution and mineral resources, economic, legal, and political aspects. **Laboratory fee, $15. (Fall and spring)**

14 Mineralogy and Petrology for Nonscience Majors (3) Carroll

Lectures and laboratory. Prerequisite: Geol 1 and 2 or permission **of instructor. (Spring)**

21–22 Physical and Evolutionary Geology (3–3) Staff

Lecture and laboratory (5 hours). Principles of geology as a base for further study in geology and related sciences. Laboratory fee, $15 per **semester. (Academic year)**

Second Group

101 History of Geological Sciences (3) Teleki

Development of scientific thought; history of geological and related **sciences. (Spring)**

105 Geological Hazards in Land-Use Planning (3) Siegel

An analysis of geological hazards and related factors that affect land-use planning. Field trip. Prerequisite: Geol 5 or 21, or permis**sion of professor. Laboratory fee, $10. (Spring)**

111 Mineralogy (4) **Carroll**

Lectures and laboratory. Morphological crystallography and systematic mineralogy. Prerequisite: Geol 1 or 21. Laboratory fee, $15. **(Spring)**

112 Crystal Optics (4) — Carroll

Lectures and laboratory. Optical phenomena of crystals and uses of the polarizing microscope. Prerequisite: Geol 111. Laboratory fee $18. (Fall)

113 Crystallography (3) — Appleman

Point-group and space-group theory, fundamentals of crystal structure, x-ray diffraction theory and application. Prerequisite: Math 31. Laboratory fee, $15. Academic year 1980-81 and alternate years.

117 Petrology (2) — Lewis

Introduction to silicate phase systems; physics and chemistry of crustal and magmatic processes; volcanic processes and products. Prerequisite: Geol 21, 111 12; Phys 1 or equivalent; or permission of instructor. (Spring)

118 Petrology Laboratory (2) — Lewis

Concurrent registration in Geol 117 required for geology majors. Prerequisite: Geol 111. Laboratory fee, $18. (Spring)

122 Structural Geology (3) — Stephens

Interpretation of geologic formations on basis of their structures. Prerequisite: Geol 22. (Fall)

123 Structural Geology Laboratory (1) — Stephens

Solution of geometrical problems of structural geology. Prerequisite or concurrent registration: Geol 122. Laboratory fee, $10. (Fall)

125 Marine Geology (3) — Pierce

Lecture and map work. Principles of oceanography and submarine geology; topography, crustal structure, sedimentary processes, and marine environment. Prerequisite: Geol 1-2 or 21-22; or permission of instructor. (Spring)

128 Geomorphology (3) — Stephens

Lecture (2 hours), laboratory as arranged. Nature and evolution of earth forms; principles of photointerpretation. Prerequisite: Geol 21. Laboratory fee, $15. (Spring)

132 Economic Geology (3) — Turner

Genesis and distribution of mineral raw materials and their uses. Prerequisite: Geol 111. (Fall)

136 Engineering Geology (3) — Geiger

For students in the School of Engineering and Applied Science. Geological principles and processes and their application to civil and mechanical engineering. Prerequisite: Math 31, Phys 2 or 4; or permission of instructor. (Spring)

141 Introductory Geochemistry (3) — Siegel

Principles and theories on the abundance, relationships, and distribution of the elements in various rock and mineral species. Prerequisites or concurrent registration: Geol 117 or equivalent; Chem 11-12, Math 30; Phys 1 or 3; or permission of instructor. Laboratory fee, $5. (Fall)

151–52 Invertebrate Paleontology (3–3) — Coates

Lecture and laboratory (5 hours), field trips as arranged. A systematic treatment of the invertebrate fossil groups, emphasis on the

macroinvertebrates. Prerequisite: Geol 1–2 or 21–22; or permission of instructor. Laboratory fee, $15 a semester. (Academic year)

154 Vertebrate Paleontology (3) — Hotton

Lecture (2 hours), laboratory or field work as arranged. General features of vertebrate morphology and evolution; problems of paleoecology and adaptation. Academic year 1979-80 and alternate years. (Fall)

158 Micropaleontology (3) — Sohn

Systematic and stratigraphic studies of important microbiota; subsurface methods. Special topics. May be repeated for credit with permission of instructor. Laboratory fee, $12. Academic year 1979-80 and alternate years. (Spring)

163 Sedimentation (4) — Lindholm

Lecture (2 hours), laboratory (4 hours), field trips as arranged. Principles of sedimentation, analysis and interpretation of sedimentary processes and environment, laboratory experiments in the properties of sedimentary particles. Prerequisite: Geol 111, 112, or permission of instructor. Laboratory fee, $15. (Fall)

166 Principles of Stratigraphy (3) — Coates

Stratigraphic principles and methods. Prerequisite: Geol 151 or permission of instructor. (Fall)

175 Hydrogeology (3) — Back

The occurrence, storage, movement, quality, and problems of pollution of subsurface water, and the hydrologic properties of water-bearing materials. Prerequisites: Geology 111, 122, Math 31; Chem 11–12; or permission of instructor. (Spring)

181 General Oceanography (3) — Maloney

Chemical and physical properties of sea water, movements of water masses, meteorological interrelations, ecology of marine plants and animals. Prerequisite: Math 31 or equivalent, or permission of instructor. (Spring)

189 Geophysics for Geologists (3) — Stephens

Basic geophysics to assist the geologist mapping and solving geologic problems. Prerequisite: Geol 21, 22, Math 31, Phys 1 or 3; or permission of instructor. (Fall)

195 Field Work (2) — Staff

Weekend field trips. Surveying, geological mapping, and specific field work methods. (Spring)

199 Undergraduate Research or Reading (arr.) — Staff

Problems approved by the staff. May be repeated once for credit. (Fall and spring)

Third Group

205 Seminar in Geology (1) — Staff

(Formerly 2 credits)

Special topics each semester. May be repeated for credit.

216 Sedimentary Petrography (3) — Lindholm

Identification, classification, and interpretation of common sedi-

mentary rocks by means of the petrographic microscope. Prerequisite: Geol 111, 112, 163; or permission of instructor. Laboratory fee, $15. (Spring)

219 Petrogenesis I (3) Lewis

The origin of selected igneous and metamorphic rock types. Laboratory fee, $15. (Fall)

220 Petrogenesis II (3) Lewis

Laboratory fee, $15. (Spring)

224 Advanced Structural Geology (3) Lewis

Rock deformation. Methods of study and the formation of structurally complex rock. Tectonics. Prerequisite: Geol 122 or permission of instructor. Academic year 1980-81 and alternate years. (Fall)

241 Marine Geochemistry (3) Siegel

Chemical composition and physical properties of sea water, chemical composition and alterations of marine sediments, thermodynamics and biochemical activity in oceans. Methods of analysis and problems of measuring. Prerequisite: Geol 141, Math 31, and permission of instructor. Recommended: Chem 22. Laboratory fee, $15. (Spring)

243 Geochemical Prospecting (3) Siegel

Application of geochemical principles and analyses to the detection of hidden ore deposits. Field trips as arranged. Prerequisite: Geology 141. Laboratory fee, $15. (Spring)

249 Seminar: Geochemistry (2) Siegel

Independent topics each semester; may be repeated for credit. (Fall or spring)

253 Paleoecology, Biogeography and Paleoclimatology (3) Coates, Kauffman

Concepts and methods in identifying bioassociations and their environments. Academic year 1980-81 and alternate years. (Fall)

254 Evolutionary Paleobiology (3) Kauffman

Consideration of modern evolutionary theory with emphasis on the fossil record. (Spring)

255 Quantitative Paleoecology (3) Buzas

Characteristics of populations applicable to the fossil record. Subject matter includes ecosystem concept, habitat, Hutchinsonian niche, life-death, size-frequency distributions, competitive exclusion principle, spatial distributions, relative abundance and diversity, quantification of community biofacies. Prerequisite: Geol 151-52, Stat 91, or permission of instructor. Academic year 1979–80 and alternate years. (Fall)

258 Micropaleontology (3) Staff

Systematic studies of important microbiota. Prerequisite: Geol 158 or permission of instructor. Academic year 1978–79 and alternate years. (Fall)

263 Sedimentary Environments (3) Lindholm

Study of selected depositional environments. Field trips as arranged. Prerequisites: Geol 163; Stat 91. (Fall)

266 Stratigraphy (3) **Coates, Kauffman**
Problems in physical and biological stratigraphy. Analysis of major facies types. Academic year 1979–80 and alternate years. (Spring)

272 Regional Geology (2) **Carroll**

295 Research (arr.) **Staff**
Research on problems approved by the staff. Open to qualified students with advanced training. May be repeated for credit. (Fall and spring)

299–300 Thesis Research (3–3) **Staff**
(Fall and spring)

Fourth Group

398 Advanced Reading and Research (arr.) **Staff**
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 Dissertation Research (arr.) **Staff**
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

GERMANIC LANGUAGES AND LITERATURES

Professors J.C. King, K. Thoenelt, C. Steiner *(Chairman)*
Associate Professorial Lecturer M.B. Guenther
Adjunct Assistant Professor B.K. Netland
Assistant Professorial Lecturer P. Werres
Lecturer A.G. Martin

Bachelor of Arts with a major in Germanic languages and literatures (departmental)—The following requirements must be fulfilled:
1. The general requirements as stated on pages 72–73, 79–85.
2. Prerequisite courses—Ger 1–2, 3–4, 9–10, 51–52; or equivalent.
3. Required courses in other areas—six semester hours of history, and six semester hours in one of the following subjects: art history, music history, or philosophy.
4. Requirements for the major—a minimum of 24 semester hours in German courses above the first group, including Ger 179–80; reasonable proficiency in speaking, reading, and writing German.

Master of Arts in the field of Germanic languages and literatures—Prerequisite: a Bachelor of Arts degree with a major in Germanic languages and literatures from this University, or an equivalent degree.

Required: the general requirements, pages 88–96, including a reading knowledge of French. The program of study consists of (1) 24 semester hours of approved course work plus a thesis (equivalent to six semester hours) in the field of German literature or linguistics or, with departmental approval, (2) 30 semester hours of approved course work without a thesis.

Bachelor of Arts in Education with a teaching field in German—Prerequisite: the education curriculum, pages 111–12.

Required: the German option and the professional courses listed on pages 115–16.

The Germanic Languages and Literature Department, through the Consortium of Universities of the Washington Metropolitan Area, Inc., cooperates in a program leading to the degree of Doctor of Philosophy at Georgetown University.

Placement Examination: A student who has not been granted advanced standing and who wishes to continue in college the language begun in high school must take a placement examination before registration. Upon completion of the examination, assignment is made to the appropriate course.

GERMAN

First Group

1–2 First-year German (3–3) Staff

Fundamental concepts of German culture: essentials of German structure and basic vocabulary; reading of easy prose and conversation. Aural-oral practice in language laboratory. Laboratory fee, $17.50 per semester. Prerequisite to Ger 2: Ger 1. (Fall and spring)

***3–4 Second-year German** (3–3) Staff

Introduction to German civilization; selections from modern German prose; continuation and review of German structure; conversation and simple composition. Aural-oral practice in language laboratory. Laboratory fee, $17.50 per semester. Prerequisite to Ger 3: Ger 1–2 or equivalent. Prerequisite to Ger 4: Ger 3. (Fall and spring)

***9–10 German Conversation and Composition** (3–3) Guenther

(Academic year)

47 Beginning German for Reading Acquisition (3) Staff

For undergraduates and graduate students with little or no German who are interested in acquiring a reading knowledge of German. No academic credit for graduate students. (Fall)

49 German Readings for Nonmajor Students (3) Staff

Primarily for graduate students preparing for reading examinations; undergraduates admitted. No academic credit for graduate students. Prerequisite: Ger 4 or 47, or equivalent. (Spring)

51–52 Introduction to German Literature—in English (3–3) Guenther

Lecture, recitation, and discussion. Selected readings in German literature from the earliest periods to the present. (Academic year)

Second Group

103–4 Major Themes of German Literature—in English (3–3) Thoenelt

Lecture and discussion. Topics for 1980-81: Ger 103—the "Faust" theme in German thought and civilization, from Goethe to Thomas Mann. Ger 104—the anti-Faust movement in German thought and civilization. Central topics: Jean Jacques Rousseau's return to nature and progress; "Realpolitik" and the arts and letters; "Kultur" and self-realization; the "Bildungsroman" and technocracy. (Academic year 1980-81 and alternate years)

---

* With permission of instructor. Ger 9 or 10 may be taken concurrently with Ger 4.

111–12 **Comparative Studies in Germanic Literatures—in English** (3–3) Thoenelt

Lecture and discussion. Topics for 1979-80: Ger 111—Absurdity and rebellion, loss and rediscovery of the self, changing Gestalt concepts, from Existentialism back to Enlightenment, selected works of Thomas Mann, Böll, Frisch, Hesse, Strindberg, Goethe and others. Ger 112—Why literature? What is literature? Views and perspectives on the "usefulness" and "uselessness" of literature in modern Western societies. From Plato to the 20th century. Selected works and excerpts from Plato, Aristotle, Horace, Shakespeare, Montaigne, Goethe, Schiller, Heine, Nietzsche, Thomas Mann, Sartre, Camus, Böll and others. [Academic year 1979-80 and alternate years]

126 **France and Germany—in English** (3) Thoenelt

Comparative study of two European ways of life as reflected and perpetuated by literature and philosophy. Relevant excerpts and documents from the 16th to the 20th century. [Summer]

131–32 **18th-Century German Literature—in German** (3–3) Thoenelt

Enlightenment, Storm and Stress, Classicism. Reading, lecture, and discussion. Central topic: *Geist und Tat* or the 18th century concept of literature's formative function in society. [Academic year 1979-80 and alternate years]

141–42 **19th-Century German Literature—in German** (3–3) Steiner

Romanticism, Biedermeier, young Germany, poetic realism. Second age of chivalry and *Sehnsucht*, revolution and counter-revolution in thought and literature. Birth and growth of modern nationalism and cosmopolitanism as reflected in the literature of the period. Reading, lecture and discussion. [Academic year 1980-81 and alternate years]

151–52 **20th-Century German Literature—in German** (3–3) Steiner

The age of Nietzsche, Naturalism, Impressionism, Expressionism; Kafka, Thomas Mann, Hesse; emigre literature, contemporary drama; authors of Gruppe 47. Reading, lecture, and discussion. [Academic year 1979-80 and alternate years]

161–62 **Studies in Modern German Literature—in English** (3–3) Steiner

Readings of representative writers of modern German prose; lecture and discussion in English. Offered as the demand requires.

179–80 **Advanced German Conversation and Composition** (3–3) Thoenelt

Discussions and compositions on literary and cultural topics, readings of newspaper articles, interpretations of selected texts (Gottfried Benn and Thomas Mann), grammar and style studies. [Academic year 1980-81 and alternate years]

Third Group

201–2 **Middle High German** (3–3) King

[Academic year 1979–80 and alternate years]

209–10 **German Expression and Style in Historical Perspective** (3–3) King

[Academic year 1980–81 and alternate years]

211–12 **History of the German Language** (3–3) King

[Academic year 1981-82 and every third year]

213–14 **Old Norse** (3–3) Allee
(Academic year 1979–80 and alternate years)

225–26 **Seminar: Linguistics** (3–3) King, Allee
Bibliography, methodology, readings, and research problems. Offered as the demand requires.

231–32 **German Classicism** (3–3) Thoenelt
Advanced study and critique of the literature of the Goethe era. The 18th century image of man; literature and society; the regenerative function of aesthetics; and the establishment of criteria for "Kunst" and "Kitsch." (Academic year 1980-81 and alternate years)

251–52 **Seminar: Studies in 20th-Century German Literature** (3–3) Steiner
Special projects in fiction, drama, poetry, and criticism. Topic for 1980–81: *Das deutsche Drama der Gegenwart*. Analysis of Weltanschauung and themes in the major dramatic works of Brecht, Dürrenmatt, Frisch, Grass, Hochhuth, and Peter Weiss. (Academic year 1980–81 and alternate years)

271–72 **Seminar: German Realism** (3–3) Steiner
Analysis of authors, work, genres, and literary trends. Topic for 1979-80: *Kritik und Aufbruch*. Investigation of German sociocritical literature from Lessing to Peter Handke. (Academic year 1979–80 and alternate years)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

SANSKRIT

105–6 **First-year Sanskrit** (3–3) King
A year course: credit toward a degree at this University given on completion of Ger 106. Language, literature, and culture of ancient India. Essentials of grammar; reading of classical texts. Aural-oral practice in language laboratory. Laboratory fee, $17.50 per semester. (Academic year 1979-80 and alternate years)

107–8 **Second-year Sanskrit** (3–3) King
A year course: credit toward a degree at this University given on completion of Ger 108. Language, literature, and culture of ancient India. Continuation and review of grammar; reading of more difficult classical and Vedic texts. Aural-oral practice in language laboratory. Prerequisite: Ger 105–6 or equivalent. Laboratory fee, $17.50 per semester. (Academic year 1980–81 and alternate years)

SCANDINAVIAN

81–82 **Beginning Scandinavian** (3–3) Netland
Introduction to Norwegian and introductory reading approach to Danish. Fundamental concepts of Scandinavian civilization. Ger 81: Norwegian, language and structure; reading, conversation, and composition. Presentation of Scandinavian culture. Ger 82: additional reading, conversation, and composition in Norwegian. Reading approach to Danish. Credit will be given for each semester. Aural-oral

practice in language laboratory. Laboratory fee, $17.50 per semester. Prerequisite to Ger 82: Ger 81 or equivalent. (Academic year)

83–84 **Intermediate Scandinavian** (3–3) Netland

Intermediate Norwegian; reading, conversation, and composition. Additional reading in Danish and Swedish. Outlines of modern Scandinavian culture, including a brief introduction to Icelandic. Students will select a special study project within the course framework. Credit will be given for each semester. Prerequisite to Ger 83: Ger 82 or equivalent. Prerequisite to Ger 84: Ger 83 or equivalent. (Academic year)

GREEK

See Classics.

HEALTH CARE ADMINISTRATION

Professors L. Gintzig, M.C. Devolites, K.J. Darr, P.N. Reeves *(Chairman)*
Adjunct Professor P.D. Nelson
Professorial Lecturer H.L. Hirsh
Associate Professors P.S. Birnbaum, R.G. Shouldice, O.L. Quintana *(Visiting)*, G.J. McHugh
Adjunct Associate Professor W.J. Auton
Associate Professorial Lecturers W.A. Parker, H.R. Wertlieb, C.C. Rorrie
Assistant Professors D.F. Bergwall, S.D. Lind *(Visiting)*
Adjunct Assistant Professors N.G. Oglesby, J.E. Montgomery, D.F. Eversmann, H.C. Coffey, P.T. Bruder, C.B. Smiley, Jr., M. Meyer
Assistant Professorial Lecturers N.B. Hadley, R.H. Hagaman, G.E. Crum
Instructor C.P. McKelvey
Adjunct Instructors W.L. Roach, Jr., J.P. Kelly
Lecturer M.G. Bromley

George Washington University offers undergraduate study leading to the degree of Bachelor of Science in Health Care Administration. The primary purpose of this bachelor's degree program is to provide students with a broad managerial education for mid-level administrative and planning positions in hospitals and related health organizations. At this time the degree program is limited to students in the Naval School of Hospital Administration at Bethesda, Maryland; for further information contact the chairman of the Health Care Administration Department.

Programs of study leading to the degrees of Master of Arts in Health Care Administration† and Post-masters Graduate Certificate in Health Care Administration, which provide preparation for professional practice in the health care services field, and areas of concentration in health care administration as study fields in programs leading to the degrees of Doctor of Business Administration and Doctor of Public Administration, are offered by the School of Government and Business Administration **(see pages 131–61)**.

Second Group

Second-group courses marked with an asterisk (*) are limited to students in the Bachelor of Science in Health Care Administration degree program at the Naval School of Hospital Administration.

†Accredited by the Accrediting Commission on Education for Health Services Administration

*108 **Survey of Health Economics** (3) Coffey

Survey of the principles and applications of economic analysis in the health field. Economic criteria required for cost effectiveness operations analysis and resources management.

*110 **Introduction to Health Care Planning** (3) Roach

Introduction to health care program and facility planning. Emphasis on the role and function of planning agencies, estimation of needs, assessment of community and facility resources, data collection and evaluation of program and facility design.

*120 **Personnel Relations in Health Care Institutions** (3) Bruder

Introduction to personnel relations in the health care environment. Research studies, as they pertain to leadership and superior subordinate relations in a multidisciplinary organization, are evaluated for practical application. Emphasis on employee cooperation, differences in ability and background, and particular problems caused by specific working conditions.

*130 **Hospital Labor Relations** (3) Meyer

Brief history of unionism, characteristics of union organizations and union movements, and the basic reasons why the government became involved in employer-employee relations. Labor laws and National Labor Relations Board decisions as applied to health care facilities. Management's role in the collective bargaining process and the administration of and "living" with collective bargaining agreements.

*140 **Hospital Financial and Material Management** (3) Eversmann

Principles, practices, functions and objectives of financial and material management of hospital operations, emphasis on the role and contributions of middle management. Costs and budgetary control, responsibility accounting, cost-based budgets, purchasing, inventory control, distribution and storage.

142 **Financial Management in Health Care Institutions** (3) Staff

Consideration of the nature, analysis and interpretation of accounting data. Cost accounting, budgeting and internal control techniques, emphasis on their use in the management planning and control process.

153 **Survey of Health Care Organization** (3) Parker, Roach

Introduction to the organization and delivery of health care services in the U.S. Emphasis on the structural features of and the resources available to the health care system. (Fall and spring)

154 **Introduction to Hospital Management and Procedures** (3) Parker, Coffey

Introduction to the structure and management of contemporary American hospitals; emphasis on the organization of hospital departments and on the functions of the department manager. (Fall and spring)

*155 **Special Problems in Health Care Management** (3) Montgomery

Supervised reading program in which the student is expected to review the literature on a middle-management problem present in contemporary American health care institutions.

*159 **Legal Issues in Health Care Administration** (3) Smiley

Recognition and comprehension of areas of legal liability in hospital activities. Knowledge and understanding of a wide variety of admin-

strative duties and responsibilities of a legal nature, such as administrative investigations, misconduct and line-of-duty determinations, administrative discipline and discharge, claims under the Medical Care Recovery Act, Federal Tort Claims Act, and other related matters.

*162 **Introduction to Hospital Information Systems** (3) Meyer

Development and discussion of a computerized integrated information system, its effect on the environment and its use within the organizational system for planning and control. Analysis of actual information systems used in hospitals.

170 **Quantitative Methods in Health Care Administration** (3) Montgomery

Application of quantitative methods to the health services industry. Fundamental statistical techniques enabling the student to read, comprehend, critically appraise and intelligently utilize the growing volume of quantitative research appearing in the health services literature. Familiarization with quantitative procedures applied to analyzing management problems in the operational environment. Emphasis on establishing a fundamental understanding of statistical ideas rather than upon manipulating predeveloped formulas.

*180 **Management Case Problems in Hospital Administration** (3) Oglesby

Management functions in the hospital setting. Management case problems in hospital administration areas such as authority relationships, communication barriers, motivation and productivity, and control techniques discussed and analyzed.

190 **Special Topics in Health Care Administration** (3)

Experimental offering at the undergraduate level. (Fall and spring)

Third Group

202 **Introduction to Health Care Systems** (3) McKelvey, Crum

Lecture and discussion (2 hours), laboratory (2 hours). Introductory description and analysis of the American health and medical care systems. Organization, characteristics and relationships of research, technology, manpower, public and private delivery, and financing mechanisms. Survey of major disease problems and their impact on administration and planning. Medical terminology. (Fall and spring)

203 **Organization and Management of Health Services Institutions** (3) Hadley, Shouldice, Hagaman

Lecture and discussion (2 hours), laboratory (2 hours). In-depth description of the functional organization and structure of the United States health system, emphasizing organizational structure and institutional interrelationships. Emphasis is also placed on understanding the managerial process at several levels within various health service institutions. Institutional ethics, statistics.

204 **Management of Health Maintenance Organizations** (3) Shouldice

Basic principles and fundamentals of prepaid group practice plans and newly forming health maintenance organizations. Emphasis on planning, development and operation of prepaid plans. (Fall and spring)

205 **Hospital Administrative Practices** (3) McHugh, Darr

Lecture and discussion (2 hours), laboratory (2 hours). Organization, management and interrelationships of hospital clinical, support and administrative departments. Analyses of procedures and systems. Hospital personnel administration. Administrative ethics. Requirements of the Joint Commission on Accreditation of Hospitals. Prerequisite: HCA 203. **(Fall and spring)**

206 **Case Studies in Health Care Administration** (3) Devolites, Birnbaum, McHugh

Discussion (2 hours), laboratory (2 hours). Intensive qualitative and quantitative analyses of major problem areas in health care administration using the case study method. Cases cover the broad spectrum of health care delivery and management: plans and operations, personnel, financial and materiel. Developing and implementing solutions. Serves as capstone course for health care administration students. Prerequisite: HCA 202, 203 and Mgt 201. (Fall and spring)

207 **Management Analysis in Health Care Institutions** (3) Lind

Lecture (2 hours), laboratory (2 hours). Basic investigation and problem-solving techniques, including various methods of collecting, analyzing, reporting and using information that can be made available to administrators of hospitals and other medical care institutions. Field assignments. **(Fall and spring)**

209 **Health Resources Management** (3) Birnbaum, Quintana, Bromley

Lecture (2 hours), laboratory (2 hours). Introduction to resource analysis, financial management and health economics; statistics of health care institutions. Estimates of health services demand and resource requirements. Preparation of budgets, financial statements and reports. Financial analysis. Public and private health insurance. Management of medical facilities and material. Regulation and containment of costs. Safeguarding hospital assets. (Fall and spring)

210 **Advanced Health Resources Management** (3) Quintana, Bromley

Development of financial health policies, objectives and programs. Application of PPBS in the health care field; financial management of multi-unit health care systems; financial aspects of national health programs, prospective rates and regulation of health prices; case studies and field research. **(Fall or spring)**

211 **Quantitative Methods in Health Service Operations** (3) Devolites, Lind

Concepts and application of quantitative methods in health service operations, involving demand analysis and forecasting, resource allocation, and quality and productivity control. (Fall and spring)

212 **Introduction to Health Planning** (3) Bergwall, Rorrie

Lecture (2 hours), laboratory (2 hours). Introduction to the history and development of health planning in the United States. Presentation of basic health planning methods and procedures at a project level. **(Fall and spring)**

213 **Comparative Health Care Systems** (3) Gintzig

Comparative evaluations of various organizational patterns, functions and trends in international health care delivery systems. Emphasis on the sources of such differences and significance of the systems to the health care of a nation. Primarily for doctoral candi-

dates; open to other students by special arrangement with the department.

214 **Health Systems Planning** (3) Reeves

Advanced planning techniques emphasizing quantative and rational methodology at the health systems level. In-depth discussion of selected critical components of the health planning process. Prerequisite: HCA 212, or permission of instructor. (Fall or spring)

216 **Seminar: Policy in Health Planning** (3) Reeves, Crum

Analysis of the legal, political, social and economic factors in health care planning, with emphasis on policy formulation and implementation. Explores the role of societal values in setting health policy. Prerequisite: HCA 212, or permission of instructor. (Fall or spring)

240 **Ambulatory Health Care** (3) Shouldice

Introduction to ambulatory health care delivery and management, including organization, financing, insurance, methods of payment for services, and models for estimating need for and construction of ambulatory health care facilities.

250 **Delivery of Mental Health Services** (3) Staff

Study of the organizations and systems for the delivery of mental health services; emphasis on administration, management and financial support of treatment and rehabilitation facilities. (Fall and spring)

260 **Introduction to Long-term Care Administration** (3) Wertlieb

Evolution of long-term institutions as a health care delivery subsystem. Comparative evaluation of characteristics of various long-term care institutions; regulation by government. Relationships between the purposes and functions of these institutions and the health care needs of the community are investigated. (Fall)

261 **Seminar: Managing the Long-term Care Institution** (3) Wertlieb

Designed to improve the abilities and effectiveness of health care administrators through a foundation of knowledge and skills in long-term health care facility organization and management. Emphasis on the range of services available in long-term care institutions. Prerequisite: HCA 260 or permission of instructor. (Spring)

†287 **Issues in Aging** (3) Lind

The nature and problems of aging including the social, psychological, biological, economic, legal and health care needs and services of the older population. Designed primarily for graduate students in social sciences, health care administration, and for students in the medical school. Open to other students with consent of instructor. (Fall and spring)

270 **Research in Health Care Administration** (3) Reeves

Field research. Primarily for doctoral students; open to other graduate students with consent of instructor. May be repeated for credit. (Fall and spring)

285–86 **Readings in Health Care Administration** (3–3) Gintzig and Staff

Supervised readings in special areas of health care administration and planning. Primarily for post-master degree students; open to

† An interdisciplinary seminar jointly sponsored by the Departments of Health Care Sciences and Health Care Administration.

other students by arrangement. May be repeated for credit. (Academic year)

287 **Health Care Administration and the Law** (3) Hirsh
Primarily for doctoral students; open to other students by arrangement. Legal duties and responsibilities, as well as rights of administrators and the health care facility, are outlined. Discussion of the legal relationships of facility personnel, legal aspects of labor relations and trends in hospital law. (Fall and spring)

288 **Field Problem Studies in Health Care Administration** (3) Reeves, Bergwall
Selected administrative and planning issues and problems arising in health care facilities. Primarily for post-master degree students; open to other students by arrangement. May be repeated for credit. (Fall and spring)

289 **Seminar: Developing National Health Care Policy** (3) Darr
Understanding and analyzing the processes by which health care policy is formulated and implemented at the federal level. Focus on Congress and the Presidency.

290 **Special Topics in Health Care Administration** (3) Staff
Experimental offering; new course topics and teaching methods. May be repeated once for credit. (Fall or spring)

291 **Seminar: Health Care Ethics** (3) Darr
Moral and ethical problems in the health care system. Legal, social, and policy implications. Current issues in medical and health care ethics, such as administrative and institutional ethics, medical professional codes, impaired professionals, death, fertility control, experimentation and new technology, resource allocation.

293-94-95 **Residency I** (3–3–3) Staff
Twelve-month residency, beginning summer, fall or spring. Work experience under a qualified preceptor, periodic written progress reports, a written major report or a selected field project.

296-97-98 **Residency II** (3–3–3) Gintzig
For selected students who take a second 12-month residency; begins summer, fall or spring.

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

Fourth Group

Fourth-group courses are primarily for doctoral students, and are offered as the demand requires. They are open to the other graduate students at the discretion of the Department.

311–12 **Seminar: Public-Private Sector Institutions and Relationships** (3–3) Staff
An analysis and critique of alternative theoretical frameworks for describing, understanding, and predicting the nature, values, and actions of American public and private institutions. Problems, potentials, and alternatives for structuring public and private institutional arrangements to meet the needs of society.

398 **Advanced Reading and Research** (arr.) **Staff**
Limited to doctoral students preparing for the general examinations. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) **Staff**
Limited to doctoral candidates. May be repeated for credit. (Fall and spring)

HEBREW

See **Classics.**

HISTORY

Professors R.H. Davison, R.B. Thompson, R.C. Haskett, R.P. Sharkey, H.M. Sachar, R.W. Kenny, P.P. Hill, L.G. DePauw, R. Thornton, L.C. Schwoerer (*Chairman*), P.F. Klarén
Adjunct Professor R.P. Multhauf
Professorial Lecturer S. Shaloff
Associate Professors C.J. Herber, W.R. Johnson, R.A. Hadley, A.D. Andrews, R.E. Kennedy, Jr., J.O. Horton
Adjunct Associate Professors A.L.K. Nelson, L.J. Lear
Assistant Professor L.P. Ribuffo

Bachelor of Arts *with a major in history (field-of-study or departmental)*—The following requirements must be fulfilled:

1. The general requirements as stated on pages 72–73, 79–85. (Students should consult the departmental advisor regarding courses to be taken in satisfying the requirement for meaningful initiation into the humanities and the natural and mathematical sciences.)

2. Required introductory courses—Hist 39-40, 71-72, or equivalent. Majors may waive one or more of the prerequisite courses by passing departmental examinations, by attaining scores of 600 or above on the College Entrance Examination Board Achievement Tests, or by good performance on Advanced Placement Examinations. Credit for one or more of the prerequisite courses may be received by superior performance on departmental or Advanced Placement Tests. The Department does not accord either waiver or credit by CLEP examination.

3. Required courses in related areas—(a) either 12 semester hours of an approved foreign language or (b) nine semester hours in statistics (Stat 53, 105, and 97).

4. (a) *Field-of-study major*—Hist 199 (Proseminar), six semester hours of third-group courses, including at least three semester hours of research seminar, and the passing of the major examination in the senior year. In planning a program, the student, under the guidance of an advisor, should choose courses which will provide a broad understanding of diverse chronological and geographical aspects of the human experience.

(b) *Departmental major*—27 or more hours of second- and third-group courses, including Hist 199, six semester hours of third-group courses, including at least one research seminar, and six semester hours chosen from each of the following fields: I (Europe)—Hist 101, 105, 106, 109, 110, 111, 112, 121, 122, 123, 124, 125, 127, 131, 132, 139, 140, 141, 142, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 198; II (United States)—Hist 128, 129, 137, 167, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 197, 198; III (Russia,

Asia, Africa and Latin America)—Hist 102, 107, 108, 113, 114, 116, 119, 143, 145, 146, 158, 161, 163, 164, 165, 166, 187, 188, 189, 193, 194, 195, 196.

A pamphlet relating to the major is available in the offices of the dean of the Columbian College of Arts and Sciences and in the History Department.

An Honors Program may be chosen by juniors with satisfactory scholastic records. Application to this program must be made before the beginning of the second semester of the junior year. Students accepted into the program take a three-hour seminar in the second semester of the junior year and complete the research requirements for the history major by preparing the Senior Honors Thesis (Hist 191–92) in the final year of undergraduate study.

Master of Arts in the field of classical archeology, classics, and history (an interdepartmental degree program offered by the Art, Classics, and History Departments)—Prerequisite: a bachelor's degree with a background in classical archeology and either Greek or Latin. Applicants from other institutions must present scores on the Graduate Record Examination to the Office of the Graduate School of Arts and Sciences.

Required: the general requirements, pages 88–96. The program of study consists of 24 semester hours of course work (as many as possible should be third-group courses) selected in consultation with the appropriate advisor from the Art, Classics, and History Departments; plus a thesis (equivalent to six additional semester hours). Candidates must pass a reading knowledge examination in French or German. All candidates are required to pass a general Master's Comprehensive Examination.

Master of Arts in the field of history—Prerequisite: a bachelor's degree from an accredited college or university with a major in history, or an equivalent degree; high scholastic standing; and approval of the department. Applicants from other institutions must present scores on the Graduate Record Examination with the Advanced Test in History and arrange for four persons, preferably former instructors, to send letters or reference forms to the Office of the Graduate School of Arts and Sciences.

Required: the general requirements, pages 88–96. The program of study consists of (1) a minimum of 30 semester hours of second- and third-group courses, including Hist 299–300 *Thesis Research*, or (2) a minimum of 36 semester hours of second- and third-group courses, including at least two research seminars (six semester hours). At least six semester hours of each candidate's program must be in third- or fourth-group history courses; a maximum of six may be in approved courses outside the History Department. To receive graduate credit, master's candidates must arrange for extra work with the instructors in order to receive graduate credit for such courses. Each student works in two fields of history and is required to pass a Comprehensive Examination in each.

Doctor of Philosophy in the field of history—Required: the general requirements, pages 88–91, 97–99, including the passing of a written examination in two appropriate foreign languages, or one foreign language and an approved tool subject, and the satisfactory completion of the General Examination in four fields. Normally, each doctoral candidate will work in one major (or general) field of study and three special fields. The major fields include the following: ancient history, medieval Europe, early modern Europe, modern Europe, United States, Latin America, modern Near East, modern Far East, Russia and East Europe. Special fields may vary from the topical (e.g., U.S. social history, European intellectual history, etc.) to the chronologically limited fields (e.g., American colonial history, Tudor and Stuart England, etc.). A student may elect one special field outside of the History Department if it is relevant to the program.

Doctor of Philosophy in the field of international relations—See pages 356–57. This degree program combines work in economics, history, and political science

Bachelor of Arts in Education with a teaching field in history—Prerequisite: the education curriculum, pages 111–12.
Required: the history option and the professional courses on pages 115–16.

Course Accessibility: All second-group courses are open to students without history course prerequisites with the exception of Hist 157 and 199.

First Group

39–40 European Civilization in Its World Context (3–3) Staff
Hist 39: political, social, economic, and cultural history to early modern era. Hist 40: from early modern era to present. (Academic year)

71–72 Introduction to American History (3–3) Staff
Hist 71: political, social, economic, and cultural forces of the United States in their world setting from the beginning to 1876. Hist 72: from 1876 to present. (Academic year)

*91 **East Asia—Past and Present** (3) Johnson and Associated Faculty
An interdisciplinary course, introducing the student to a comprehensive and integrated understanding of the civilization and present problems of East Asia.

Second Group

101–2 History of Revolution (3–3) Thompson
Hist 101: revolution as a theme in world history from ancient times to Luther, Cromwell, and Robespierre. Hist 102: revolution and the revolutionary movement in the age of Marx, Lenin, and Mao. (Academic year)

105–6 History of Science (3–3) Multhauf
Hist 105: from ancient natural philosophy through the 17th-century scientific revolution. Hist 106: from the Industrial Revolution to the 20th-century amalgamation of science and technology. (Academic year)

107 The Ancient Near East and Egypt to 322 B.C. (3) Hadley
(Formerly Hist 108)
Survey of Egyptian, Mesopotamian, Anatolian, West Semitic, and Iranian civilizations from the Neolithic period to Alexander's conquest.

108 Greece and the Near East, 359 B.C. to the Second Century A.D. (3) Hadley
Survey of cultural, social, political, and economic developments in the Hellenistic world and societies of the Near East from the reign of Philip II to the height of Roman power and influence in these regions.

109 Early Aegean and Greek Civilizations to 338 B.C. (3) Hadley
Neolithic background: Bronze age—Minoan, Helladic, and Mycenaean

*An interdepartmental course offered by the History, East Asian Languages and Literatures, Economics, Geography and Regional Science, Philosophy, Political Science, and Religion Departments.

civilizations: classical Greek civilization to the Macedonian conquest. (Fall)

110 **The Roman World to 337 A.D.** (3) Hadley

Prehistoric Italy; rise and decline of the Roman Empire and Late civilization: cultural, social, and political developments in the Greek world under Roman rule. (Spring)

111–12 **Medieval History** (3–3) Andrews

Hist. 111: Failure of the old Roman Empire, formation of barbarian kingdoms in the West and their evolution to about 1000 A.D. Byzantium and Islam at their apogee. Hist. 112: Medieval European daily life, institutions, and creative movements to about 1400, the Crusades and the Near East to the rise of the Ottoman Turks. (Academic year)

116 **History of Africa** (3) Shaloff

Survey of political, cultural, and economic development from ancient times to the present. (Spring)

119 **China in the 20th Century: Reform and Revolution** (3) Johnson

Origins, goals, substance, and significance of political, social, and intellectual upheavals in China from 1900 to the present. (Summer)

121 **The Renaissance in Western Europe** (3) Schwoerer

Political, socioeconomic, intellectual, and cultural developments, from the 14th to 16th centuries, with emphasis upon Italian city-states. (Fall)

122 **The Reformation in Western Europe** (3) Herber

Religious, political, and social consequences of the theological upheavals of the 16th century. (Spring)

123 **European Intellectual History I** (3) Kennedy

Popular culture: religion and science in the 17th century: the Enlightenment: Voltaire, Hume, Rousseau, Montesquieu, Beccaria, D'Holbach: Condorcet on religion, history, nature, society, and politics: the intellectual origins of the French Revolution. (Fall, even years)

124 **European Intellectual History II** (3) Kennedy

Intellectual responses to the French Revolution: 19th-century historical approaches to society, religion, economics, biology, ethics, and psycholanalysis: Hegel, Comte, Marx, Darwin, Nietzsche, and Freud: the intellectual origins of Nazism: literary, artistic, and philosophical responses to World War I. (Spring, odd years)

125 **Women in European History** (3) Staff

A study of the role of women in the political, social, intellectual, and economic life of Europe from the Middle Ages to the 20th century. (Spring)

*127 **Theories of History** (3) Levine

Major philosophies of history: Judeo-Christian, idea of progress, historicism, Hegelian-Marxist dialectic, cyclical (Vico, Spengler, Toynbee), and social-scientific (Kant, Weber) views. Contemporary problems of historical knowledge. (Fall)

* An interdepartmental course offered by the History and Philosophy Departments.

128–29 **War and Society** (3–3) McDonald

How wars, armed forces, and defense policies have affected British and American politics and society. Special attention to the relationship of defense and foreign policy, civil-military relations, the development of strategic thought, and to the naval and military influence Britain and America have exerted on each other. Hist 128: from 1776 to 1918. Hist 129: 1919 to the present. (Academic year)

131–32 **History of Germany** (3–3) Herber

Political, social, and cultural development. Hist 131: from mid-17th century to Bismarck. Hist 132: from William II to the present. (Academic year)

136 **Europe in the 20th Century** (3) Sachar

Diplomatic, political, and cultural developments from the turn of the century to the present. (Summer)

137 **U.S.-Soviet Strategic Relations Since World War II** (3) Thornton

Survey of U.S.-Soviet global rivalry from World War II to the present; comparative historical assessment of the changing strategic balance. (Spring)

139–40 **World History in the 20th Century** (3–3) Sachar

Diplomatic, political, and cultural factors. Hist 139: from the turn of the century to the Munich settlement of 1938. Hist 140: from the Munich settlement to the present. (Academic year)

141 **History of France I** (3) Kennedy

Old Regime: Louis XIV, demography, peasants, bourgeois, nobles; Church-Protestant-Jewish relations; salons, Enlightenment and *philosophes*; literacy and education; Robespierre and Revolution; Napoleon. (Fall, odd years)

142 **History of France II** (3) Kennedy

The Revolutionary tradition, and authoritarianism from the Restoration to De Gaulle; the events of 1848, socialism and the class struggle; women, marriage, morals, and population; industrialization and rural France; dechristianization, Catholic integralism and worker priests; France's decline as a world power; its intellectual and artistic leadership. (Spring, even years)

143 **Europe East of the Elbe, 1815-1939** (3) Staff

Poland, the Danube countries, and the Balkans in the 19th and 20th centuries. (Fall)

145 **Imperial Russia** (3) Staff

From the reign of Peter the Great to World War I. (Fall)

146 **Soviet Russia** (3) Staff

The Russian Revolution and Soviet rule to the present. (Spring)

*147 **Economic History of Modern Europe** (3) Sharkey

Economic development since the Middle Ages; emphasis on the period following the Industrial Revolution. Evolution of capitalism and its impact upon the societies of Europe. (Spring)

* An interdepartmental course offered by the History and Economics Departments.

148 The French Revolution (3) **Kennedy**

Social, political, economic, and cultural history of the decade of revolution, 1789-1799. Attention to its structural consequences in France and in Europe-at-large. (Summer)

149–50 European Diplomatic History (3–3) **Davison**

Emphasis on policies and actions of the great powers and their statesmen. Issues of war and peace, international crises, nationalism, alliances, and tensions. Hist 149: 1812 to 1890. Hist 150: since 1890. Students who receive credit for Hist 150 cannot receive credit for Hist 157. (Academic year)

151–52 History of England (3–3) **Kenny**

Development of English civilization and its impact on Western culture. Hist 151: to 1689. Hist 152: since 1689. (Academic year)

153 Tudor England (3) **Kenny**

Aspects of the constitutional, social, intellectual, economic, and religious development of England, 1485-1603.

154 Stuart England (3) **Schwoerer**

Grand Rebellion, Restoration, and Glorious Revolution. The political, religious, socioeconomic, and intellectual developments in England, 1603–1714. (Spring)

155 History of Modern Ireland (3) **Kenny**

The political and cultural development of Ireland since the Middle Ages and the continuing interaction between Ireland and England, with emphasis on the period from the Act of Union of 1801 to the Partition of 1923.

156 Winston Churchill as War Leader (3) **McDonald**

Churchill's role—from cavalry subaltern to prime minister—in the British Empire's wars during his lifetime, with special attention to the two world wars.

157 20th-Century European Diplomatic History (3) **Sachar**

The main currents, with necessary 19th-century background. Students who receive credit for Hist 157 cannot receive credit for Hist 150. (Fall)

158 Modern Jewish History (3) **Sachar**

A secular history of the Jewish people from the 18th century to the present state of Israel: emphasis on European political, economic, and cultural influences. (Spring)

161 Revolution in 20th-Century Latin America (3) **Klarén**

An examination of the major social revolutions in modern Latin America, especially in Mexico (1910), Bolivia (1952), Cuba (1959), and Chile (1970): their origins, social composition, leadership, and ideology. (Spring)

163–64 History of Latin America (3–3) **Klarén**

Hist 163: Analysis of Spanish and Portuguese imperialism in the New World, 1492-1820. Hist 164: a problems approach to Latin America, 1820 to the present: thematic emphasis on neo-colonialism, corporatism, liberalism, *caudillismo*, modernization, populism, and revolution. (Academic year)

165 **Latin American Responses to the Industrial World, 1820–1945** (3) Klarén

Examination of the political/diplomatic responses of Latin American nations, individually and collectively, to the expanding industrial powers of the Northern hemisphere in the 19th and 20th centuries. (Fall)

166 **History of Mexico** (3) Klarén

Focus on Aztec imperialism, the Indian view of the Conquest, landlord/peasant relations, the struggle for independence, the Revolution of 1910; race, caste and class in modern Mexico; the role of the modern Mexican state. (Fall, alternate years)

167 **Man-Made America: The Old Colonial Scene** (3) Haskett

An interpretive tour through the early American landscape, 1607–1750. Heavily illustrated with color slides. (Fall)

168 **Man-Made America: Views of a New Nation** (3) Haskett

An interpretive tour through the early American landscape, 1750–1820. Heavily illustrated with color slides. (Spring)

169 **The American Revolution** (3) DePauw

The political, intellectual, social, military, and economic impact of the events surrounding the separation of the United States from the British Empire. Special attention to the influence of non-elite groups. (Spring)

170 **U.S. Early National History** (3) Hill

Political, diplomatic, economic, and social history of the early republic, 1789–1828. (Fall)

171–72 **U.S. Social History** (3–3) Horton

Hist 171: daily life, institutions, intellectual and artistic achievements of the agrarian era, 1607–1861. Hist 172: the urban-industrial era from 1861 to present.

173 **Afro-American History** (3) Horton

Survey of the Afro-American experience, emphasizing the contributions of black Americans to, and their impact upon, American history. Same as AmCv 173. (Fall)

174 **Special Topics in Afro-American History** (3) Horton

Concentration on specific issues central to the Afro-American experience. Consult Spring *Schedule of Classes* for issues to be addressed. Same as AmCv 174. (Spring)

175–76 **U.S. Political History** (3–3) Haskett

A study of power: who gets what, where, when, and how. Hist. 175, 1763–1865; Hist. 176, 1865–1960. (Academic year)

177 **The Ante-bellum South** (3) DePauw

Investigation of political, economic, intellectual, social, and cultural characteristics of the American South prior to 1860. Special attention to myths associated with the South, ideologies supporting the slave system, and cultural practices among the white, black, and Indian populations. (Fall, alternate years)

178 **Recent U.S. History** (3) — Ribuffo

Political, social, and intellectual history from 1890 to the present. (Fall)

*179–80 **U.S. Economic History** (3–3) — Sharkey

Economic growth from colonial times to the present. Development of various sectors in the economy and their interdependence. Hist 179: 1607–1865. Hist 180: from 1865 to the present. (Academic year)

181–82 **U.S. Diplomatic History** (3–3) — Hill

American foreign relations from the era of the American Revolution. Hist 181: to 1898. Hist 182: 20th century. (Academic year)

183 **American Intellectual History** (3) — Ribuffo

Aspects of social and political theory, religious thought, literary criticism, and popular psychology from the late 19th century to the present. (Summer)

184 **Civil War and Reconstruction** (3) — Staff

(Formerly American Secretaries of State)

How the Union and Confederacy organized for war, evolved strategies, and searched for commanders who could win battles and how the war affected ordinary soldiers and citizens. Political, economic and social consequences of the Civil War.

†185 **History of Women in America** (3) — DePauw

Survey of the political, economic, social, military, religious, intellectual, and cultural practices in North America from 1000 A.D. to the present as these have affected and been affected by the female half of the population. (Fall)

186 **U.S. Urban History** (3) — Gillette

The American city from colonial foundations to the present, relating social and economic forces to physical form. Special emphasis on transitions from pre-industrial to industrial to metropolitan forms, focusing on implications for public policy and historic preservation. Same as AmCv 186. (Fall)

187 **History of Modern China** (3) — Johnson

China since 1840, particular attention to political developments. (Fall)

188 **History of Chinese Communism** (3) — Thornton

Survey of the leadership, ideology, structure, and foreign and domestic policies of the Chinese Communist Party from its inception to the present. (Fall)

189 **History of Modern Japan** (3) — Sigur

Japan's century of modernization—from the Meiji Restoration of 1868 to the present. Emphasis on historical, political, economic, and cultural factors. (Fall)

‡190 **Ethnohistory** (3) — Wagner, Humphrey

Reconstruction of the history of a selected preliterate society through the analysis of historical documents, oral traditions, archeological re-

---

* An interdepartmental course offered by the History and Economics Departments.
† Joint offering of the History Department and the American Studies Program.
‡ Joint offering of the Anthropology and History Departments.

mains, and other indirect sources. Specific topic to be announced in the *Schedule of Classes.*

191–92 **Senior Honors Thesis** (3–3) Herber
Required of and open only to undergraduate honors candidates in history. (Academic year)

193 **History of the Near East** (3) Davison
Byzantine, Arab, Persian, and Islamic backgrounds; rise and decline of the Ottoman Empire; action of European powers in the area; Ottoman breakup into the Turkish Republic and other states. (Fall, even years)

194 **History of the Modern Near East** (3) Davison, Sachar
Beginning with Napoleon's invasion of Egypt. Development of nationalism and of modern states; impact of the West on culture and institutions; great-power imperialism; crises of Turkish Straits, Suez, Arab-Israeli relations; and other issues. (Fall, odd years)

195 **Traditional Civilizations of China and Japan** (3) Johnson
(Formerly History of East Asia)
Intellectual, institutional, and social development of the traditional civilizations of China and Japan from their origins to 1800. (Fall)

196 **The Modern Transformation of China and Japan** (3) Johnson
(Formerly History of East Asia)
The social, political, and intellectual transformation of China and Japan from the mid-19th century to the present. (Spring)

197 **Oral History and Interview Techniques** (4) Staff
Introduction to theory and practice of obtaining and using historical data through recorded interviews. Examination of major published works in oral history. Particular attention to ongoing oral history projects in the Washington area.

198 **Special Topics in History** (3) Staff
Historical perspectives on great issues of past and present. New topic each semester.

199 **Proseminar: Readings for the History Major** (3) Staff
Required of senior history majors. Readings and discussions on major trends in history; representative selections from the classics of historical literature. Students who receive credit for Hist 199 cannot receive credit for Hist 201. (Fall and spring)

Third Group

Prerequisite to all third-group history courses: the appropriate second-group preparation and consent of instructor.

201 **History and Historians** (3) Staff
Historiography and historical method for graduate students. Readings and discussions on major trends in history; selections from classics of historical literature. Students who receive credit for Hist 201 cannot receive credit for Hist 199. (Spring)

203–4 **Research Seminar** (3–3) Staff
Offered on demand for individual research programs. Prerequisite: approval of department. (Academic year)

205 **Evolution of Nationalism in Eastern Europe** (3) Petrov

Formation of national consciousness and emergence of modern East European states after World War I. Developments of the interwar period. Open to qualified undergraduate seniors. (Fall)

206 **Revolution in Eastern Europe** (3) Petrov

Transformations of East European states during World War II. Resistance movements, communization, and national self-assertion in the immediate post-Stalin period. Open to qualified undergraduate seniors. (Spring)

207 **Seminar: the Communist Party of the Soviet Union** (3) Staff

Readings and discussions. Evolution of the Communist movement in Russia. Party origins, growth, and organization; intra- and inter-party strife. (Spring)

209–10 **Seminar: Topics in Ancient History** (3–3) Hadley

Readings and discussions on general topics in the history of the ancient Near East, Greece, or Rome. Topics to be announced in the *Schedule of Classes*. Students with working knowledge of the appropriate language(s) may receive research credit.

211–12 **Seminar: Medieval History** (3–3) Andrews

Prerequisite: Hist 111 12 or equivalent. Students with working knowledge of Latin may receive research credit. Each semester will focus on a particular area and period, with emphasis on interdisciplinary research techniques. (Academic year)

215 **Transformation of the Socialist Commonwealth** (3) Petrov

Soviet relations with East European and Asian socialist states from the end of World War II to the Sino-Soviet split. Changes in substance and form in relations among ruling Communist parties. Open to qualified undergraduate seniors. (Summer)

217–18 **Seminar: Russian and Soviet Thought** (3–3) Staff

Readings and discussions. Selected topics in the intellectual and social history of 19th and 20th century Russia. Topical and diachronic approach.

220 **History of Universities** (3) Andrews

The modern university since about 1830: emphasis on recent trends and their origins; influence of earlier concepts and institutions. Higher education in its larger intellectual, social, and political context: critical examination of theories. Same as EPol 220. (Spring, odd years)

224 **Reading Seminar: European Intellectual History** (3) Kennedy

Cultural history of the French Revolution. Interrelated changes in political and economic thought, theater, arts, religion, and science from 1789 to 1799. Continuity or discontinuity with pre- and post-revolutionary cultural life.

*225 **History of Washington, D.C.** (3) Gillette

The social history of Washington, from village to metropolis, with emphasis on the evolution of residential neighborhoods and related issues of historic preservation and conservation. Field trips.

* Offered jointly by the Department of History and the American Studies Program.

228–29 **Modern Military and Naval History** (3–3) McDonald

Discussion, readings, and research in 20th-century British and American military and naval history. Special attention to World War I (Hist 228) and World War II (Hist 229). Topics include Anglo-American coalition warfare, and the interaction of strategy, diplomacy, and national policy in both war and peace.

*232 **Comparative Communist Systems I** (3) Wolchik

Ideological foundations of communism; emergence of the Soviet system; development of the international communist movement to World War II; postwar formation of the Soviet bloc. (Fall)

*233 **Comparative Communist Systems II** (3) Wolchik

Comparative analysis of major recent ideological trends and political institutions and behavior among ruling and nonruling Communist parties. (Spring)

234 **Modern Archives Administration** (3) Peterson†

Open to history graduate students and undergraduate majors. Lectures and discussion on all phases of administering archival materials. Classes at National Archives. Students must enroll before September 1 for October session, before April 1 for June session.

237 **Seminar: Soviet Foreign Policy, 1917-1960** (3) Petrov

Concepts and perceptions guiding Soviet relations with the outside world. From the blockade and intervention, through years of isolation, World War II, the Cold War, to "peaceful co-existence" and detente. Open to qualified undergraduate seniors. (Fall and summer)

239–40 **Early Modern European History** (3–3) Schwoerer

Readings, discussion, and research on topics selected from Western European history of the 14th through 17th centuries.

241–42 **Research Seminar: Modern European History** (3–3) Herber

Prerequisite: appropriate preparation and consent of instructor.

245 **Studies in World History** (3) Thompson

Topic for 1980. Six major systems in the philosophy of history: Plato, Augustine, Hegel, Marx, Spengler, Toynbee.

246 **Seminar: Modern Russian History** (3) Staff

Discussions, readings, research. Selected topics in the domestic history of modern Russia. (Fall)

247 **The Theory and Practice of Modern Imperialism** (3) Sharkey

Critical analysis of Marxist and non-Marxist theories of modern imperialism in the light of late 19th and 20th century European and American experiences in Asia, Africa, and Latin America. (Fall)

248 **Reading Seminar: Modern European and Near Eastern History** (3)

Admission by permission of instructor.

249 **European Diplomatic History** (3) Davison

Research seminar in individually selected topics concerning the foreign policies, actions, and interrelations of the European great

* An interdepartmental course offered by the History and Political Science Departments.
† T. H. Peterson is Director of the Modern Archives Institute.

powers and their statesmen in the 19th or 20th centuries. Reading knowledge of one language other than English required. (Fall)

251–52 **English People and Institutions** (3–3) Kenny, Schwoerer
Research seminar. Selected topics in the political, social, intellectual and economic history of England. Each semester will focus upon one time period and special area of interest.

255–56 **U.S.-Soviet Strategic Relations Since World War II** (3–3) Thornton
(Formerly Hist 208)
Seminar designed to develop a conceptual framework for understanding contemporary U.S.-Soviet relations. Readings the first semester; research the second. (Academic year)

261 **Reading Seminar: Topics in 20th-Century Latin America** (3) Klaren
(Formerly Agrarian Society and Polity in Latin America)
Admission by permission of the instructor. (Fall)

262 **Research Seminar: Agrarian Society and Polity in Modern Latin America** (3) Klarén
(Formerly Rise of Capitalism in Modern Latin America)
Research on the impact of modernity (e.g., foreign capital, immigration, internal migrations, capitalism) on traditional rural society. Admission by permission of instructor. (Spring)

271–72 **U.S. Social History** (3–3) Horton
Discussion seminar on American daily life, institutions, and intellectual and artistic achievements.

*274 **Research Seminar: Materials in Afro-American Culture** (3) Horton
Prerequisite: Hist 173 and 174 or equivalent. (Academic year)

275–76 **U.S. Political and Colonial History** (3–3) Haskett
Research or readings, depending on student interest. Topics on various aspects of the colonial period or political aspects of various periods. Admission by permission of instructor. (Academic year)

†277–78 **Historic Preservation** (3–3) Pearce
The preservation movement and its literature. Review of current experience, preservation practice, and techniques. Emerging aspects of historic preservation. Examples of historic, cultural, and humanistic values affecting preservation activities. Admission restricted to master's degree candidates in historic preservation program. (Academic year)

279 **Research Seminar: American History** (3) Staff
Admission by permission of instructor. (Summer)

281–82 **Research Seminar: U.S. Diplomatic History** (3–3) Hill
Prerequisite: Hist 181-82 or equivalent. (Academic year)

283–84 **Research Seminar: Recent U.S. History** (3–3) Ribuffo
Prerequisite: six semester hours of 100-level American history courses. (Hist 283—fall)

---

* Offered jointly by the History Department and the American Studies Program.
† Joint offering of the History and Urban and Regional Planning Departments and the American Studies Program.

285 **Research Seminar: Women in the United States** (3) DePauw
Prerequisite: Hist 185 or equivalent. Practical examination of research, writing, and publication problems in the preparation of scholarly articles for feminist and historical journals. (Spring)

286 **Readings/Research in Early American History** (3) DePauw
At the option of the individual student, this course will offer readings illustrating the methods of some of the most highly acclaimed authors working in the field of Early American history today, or a practical exercise in writing a short article intended for publication. (Spring)

287 **Seminar: Problems in Latin American Civilization** (3) Staff
Interdisciplinary seminar partially guided by a specialist within the methodology of a chosen discipline; each student writes a report on some aspect of a selected key theme. Admission by permission of instructor. (Spring)

288 **History of Chinese Communism** (3) Thornton
Research seminar on selected topics related to China. Emphasis is on developing research methods, concepts, and the preparation of a scholarly paper. (Spring)

289 **Seminar: Modern Japanese History** (3) Sigur
Discussion and research on selected topics in modern Japanese history from the Meiji Restoration of 1868 to the present. (Spring)

291 **Seminar: 20th-Century History** (3) Sachar
Research seminar on selected topics.

292 **Israel, Zionism, and the Arab World** (3) Sachar
(Formerly The Palestine Question in Modern History)
Research seminar. (Spring)

294 **Seminar: The Modern Near East** (3) Davison
Readings, discussion, and research in selected political, economic, social, cultural, and international developments in the 19th and 20th centuries concerning countries from the Balkans, through Turkey and the Arab countries, to Iran. (Spring)

295–96 **The Modern Far East** (3–3) Johnson
Research seminar.

297 **Special Topics Seminar** (3) Staff
Open to doctoral and master's candidates and qualified undergraduates. May be repeated for credit. Offered whenever five or more students can be enrolled.

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

Fourth Group

Prerequisite to all fourth-group history courses: the appropriate second-group preparation and consent of instructor.

Fourth-group history courses are primarily for doctoral students, but master's degree candidates may be admitted.

The University is a member of the Folger Institute of Renaissance and 18th-century Studies. The policies of the Institute are set by a central committee on

which each member institution is represented. Doctoral students enrolled in one of the Institute seminars are eligible to apply for fellowship aid. Folger Institute Seminars are numbered 301 through 308. Students wishing to register for these courses should consult the chairman of the History Department.

301–308 **Folger Institute Seminars** (3 each) Staff
Topics will be announced.

342 **Readings in Modern European History** (3) Davison
From the French Revolution to the period following World War I (Spring)

*379–80 **Readings in Economic History** (3–3) Sharkey
Hist 379: American economic history. Hist 380: modern European economic history. (Academic year)

382 **Readings in American Diplomatic History** (3) Hill
(Fall)

385 **Readings in the History of Women in America** (3) DePauw
Intensive bibliographic and historiographic examination of broad subject areas within which class members have active research interest. (Spring)

386 **Readings in Early American History** (3) DePauw
(Fall)

387–88 **Readings in the History of Sino-Soviet Relations** (3–3) Thornton
A systematic approach to the study of the history and historiography of Sino-Soviet relations. Hist 387: 1917–1949; Hist 388: 1950 to the present.

395–96 **Readings in Modern Far Eastern History** (3–3) Johnson

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

HUMAN KINETICS AND LEISURE STUDIES

Professors L.M. Stallings, J.L. Breen *(Chairman)*, D. Hawkins, J.E. Snodgrass
Adjunct Professor D.C. Paup
Professorial Lecturers E.L. Shafer, R. Anzola-Betancourt, C.A. Troester, Jr., J.M. Rovelstad
Associate Professors L.H. George, M.R. Withers, A.L. Dickerson *(Research)*
Associate Professorial Lecturers T. Songster, D.L. Edgell
Assistant Professors H. Nashman, N.D. Johnson
Assistant Professorial Lecturers B.S. Katz, S.Y. Cha, L. Houstoun, Jr., P.G. Davidoff, D.C. Frechtling, T.J. Riegert, V.S. Annand, J.V. Ackerman
Lecturers M.M.H. Ramsay, E.A. Burkhardt, K. Cotton, J.J. Goldblatt, W.C. DeMull, K.G. McCort, L.E. McDevitt, S.E. White
Instructors D.C. Park *(Research)*, A. Morris *(Research)*

* An interdepartmental course offered by the History and Economics Departments.

Programs of study leading to the degrees of *Bachelor of Science in Human Kinetics and Leisure Studies* (opportunity for specialization in elementary and secondary school physical education, dance education, or dance as a performing art) and *Master of Arts in Education* (with specialization in adaptive physical education, dance, perceptual-motor development, general physical education, therapeutic recreation, or tourism development and travel administration) are offered by the School of Education and Human Development (see pages 101–31).

The University is not responsible for injuries received in any of the activities of the Department of Human Kinetics and Leisure Studies, and the student assumes full responsibility therefor.

First Group

Credit for HKLS activities courses is not generally recognized for the baccalaureate degree. For students pursuing the B.S. in H.K.L.S., however, credit is accorded for such courses.

Students whose medical examinations indicate the desirability for remedial or restricted activity are assigned to programs especially adapted to their needs. Unless otherwise indicated, all first-group courses are offered both in the fall and spring semesters.

All first-group courses may be repeated with permission of the instructor.

10 Beginning Badminton (1)	**Breen**
12 Introduction to Ballet (1)	**Staff**
13 Beginning Ballet Technique (1)	**Staff**
14 Beginning/Intermediate Ballet Technique (1)	Staff
15 Advanced Ballet Technique: Pointwork (1)	Staff
16 Introduction to Modern Dance (1)	Staff
17 Beginning Modern Dance Technique (1)	Staff
18 Beginning/Intermediate Modern Dance Technique (1)	Staff
19 Ethnic Dance (1)	**Staff**
20 Beginning/Intermediate Golf (1)	Staff
21 Foil Fencing (1)	**Staff**
22 Basketball (1)	**Staff**
24 Volleyball (1)	**Staff**
26 Tae Kwon Do (Korean) (1)	**Cha**
27 Beginning Tennis (1)	**Staff**
28 Intermediate Tae Kwon Do (Korean) (1)	Cha
29 Yoga (1)	**Staff**
30 Body Conditioning (1)	**Staff**
32 Beginning Swimming (1)	**Staff**
33 Swimming/Life Saving (1)	**Staff**
34 Intermediate Swimming (1)	Staff

35 **Slimnastics and Weight Training** (1) Staff

36 **Springboard Diving** (1) Staff

38 **Racketball** (1) Staff

39 **Handball** (1) Staff

40 **Squash** (1) Staff

42 **Aerobic Dance** (1) Staff

51 **Gymnastics** (2) Staff
Emphasis on apparatus and trampoline

52 **Modern Dance Technique I** (2) Staff

53 **Modern Dance Technique II** (3) Staff
Prerequisite: HKLS 52 or permission of instructor.

54 **Intermediate/Advanced Tennis** (2) George
Development of skills, theories of strategy; emphasis on competitive play as a lifetime sport.

55 **Swimming—Water Safety Instruction** (2) Staff

56 **Scuba Diving** (2) Staff
Laboratory fee, $100.

57 **Intermediate/Advanced Badminton** (2) Breen
(Spring)

58 **Intermediate Ballet Technique** (3) Staff
Admission by permission of instructor.

59 **Team Sports** (2) Staff
(Fall)

60 **Racket Sports** (2) Staff
(Spring)

61 **Aquatics** (2) Staff
(Fall)

62 **Conditioning/Weight Training** (2) Staff
(Spring)

63 **Games and Movement Activities for Children** (2) Staff
(Spring)

64 **Horseback Riding** (2) Staff
Laboratory fee, amount announced in *Schedule of Classes*.

65 **Skiing** (2) Staff
Laboratory fee, amount announced in *Schedule of Classes*. (Spring)

66 **Synchronized Swimming** (2) Staff

68 **Sport Clinics** (2) Staff
Special intensive study and skill development.



Second Group

101 Physical Education and Sports in Human Resource Centers (3) — Snodgrass

Development of physical education and sports programs in schools and play settings. Includes philosophy and curriculum

102 Movement Education (3) — **Snodgrass**

Techniques of teaching movement education with emphasis on problem-solving methods for kindergarten and grades 1–6. (Fall)

103 Professional Foundations and Concepts of Human Kinetics and Leisure Studies (3) — Snodgrass

Nature, scope, and scientific basis of human kinetics and leisure studies; orientation to professional competencies.

104 Introduction to Travel and Tourism (3) — Davidoff

Survey of the travel and tourism industry with emphasis on the travel agency, marketing tourism and travel, research and development of tourist destinations, and the economic and social impact of tourism. (Fall)

105 Introduction to Adaptive Physical Education and Therapeutic Recreation (3) — Morris

Philosophy, methods, and concepts relating to recreation and adaptive physical education for the ill, aged, and disabled. Concepts in program planning, leadership, and adaptations of activities to special groups. Includes field visitation and analysis of activities. (Fall)

106 Introduction to Dance Therapy (3) — Staff

General survey of dance therapy areas from theoretical and experimental points of view. Exploration of professional opportunities and training. (Spring)

107 Ethnic Dance (2) — **Johnson**

Methods and materials of European folk and social forms of dance. Laboratory experiences assigned. (Spring)

108 Dance Improvisation (3) — **Staff**

Awareness of body movements, environment, group dynamics, performance and composition through improvisational technique. (Fall and spring)

109–10 Dance Composition (3–3) — **Withers**

HKLS 109: basic elements and principles of composition. HKLS 110: advanced problems in composition. Prerequisite: HKLS 108 or equivalent. (Academic year)

111–12 Sports Education Technique (3–3) — **Staff**

Techniques for teaching individual, dual, and team sports. (Academic year)

113–14 Practicum (3–3) — **Staff**

Pre-practice teaching or practical experience in elementary or secondary school physical education, adaptive physical education, dance, or tourism settings. Seminars relating to field experiences. (Academic year)

115 **Movement Technique for Theater** (2) Ramsay
(Formerly one credit)
Basic body awareness, sensory awareness, and movement exploration. Analysis of movement and dramatic justification of movement. May be repeated for credit. (Fall)

116 **Mime Movement and Theater** (2) Ramsay
Fundamentals of mime for the beginner. Isolation and illusion exercises. Work with masks, building improvisation and set pantomimes. May be repeated for credit. (Spring)

117 **Dance Education** (3) Johnson
Organizational, methodological, philosophical and conceptual approaches to the teaching of dance in academic and nonacademic settings. Prerequisite: HKLS 157. (Fall)

118 **Special Problems in Dance Composition** (1) Staff
Work with elements of movement leading to short composition studies. Prerequisite: HKLS 109–10 or equivalent. (Fall and spring)

119 **Creative Dance for Children** (3) Withers
Dance as an expressive art medium for children: concepts, principles, methods and materials. Emphasis given to dance in elementary education with consideration for special education. (Spring)

120 **Repertory** (2) Staff
Study and performance of dance works. Admission by permission of instructor. May be repeated for credit. (Fall and spring)

121 **Modern Dance Technique III** (2 or 3) Staff
Intermediate advanced modern dance. Prerequisite: HKLS 53. Admission by permission of instructor. May be repeated for credit. (Fall and spring)

122 **Methods and Materials for Health Education** (3) Staff
Conceptual approach to curriculum design and teaching, including planning and organization, methodology, selection and use of materials and evaluation; basic health knowledge. (Fall and spring)

123 **Modern Dance Technique IV** (2 or 3) Withers
Advanced modern dance. Prerequisite: HKLS 121. Admission by permission of instructor. May be repeated for credit. (Fall and spring)

129 **Introduction to Motor Learning** (3) Stallings
Concepts of motor skill learning applied to the teaching of movement skills. (Fall)

130 **Introduction to Motor Development** (3) Snodgrass
Study of the evolvement and refinement of fundamental movement skills. (Spring)

133 **Student Teaching** (6 to 12) Nashman
Prerequisite: HKLS 113 14 or equivalent. Admission by permission of instructor. (Fall and spring)

135–36 **Dance History** (3–3) Johnson
Study of dance from antiquity to present: emphasis on cultural significance of dance as art, education, and social behavior. (Academic year)

137 **Dance and Movement Analyses** (3) Staff

Concepts and elementary principles underlying Laban's system of movement analysis with emphasis on effort and shape (Spring)

138 **Curriculum, Organization and Administration of Physical Education and Athletics** (3) George

Curriculum and administration related to physical education and athletic programs. Professional ethics. (Fall)

139 **Coaching Behavior** (3) **Snodgrass**

Study of behavioral patterns and interactions related to individual and team sports. (Spring)

141–42 **Theater Production for Dance** (3–3) Staff

Theory and practicum in technical aspects of dance production, lighting, sound, theater management, costuming, make-up, publicity, promotion, and audiovisual techniques. (Materials to be purchased.) (Academic year)

144 **Choreography** (3) **Staff**

Solo and group. May be repeated for credit. Prerequisite: HKLS 109–10 or equivalent; HKLS 141–42 recommended. (Fall and spring)

150 **Introduction to Human Anatomy** (3) Stallings

Systematic study of the structure of the human body. (Fall)

151 **Kinesiology** (3) **Paup**

Analysis of human movement, including mechanical physics, anatomy, and physiology. Prerequisite: an approved course in anatomy. (Spring)

156 **Application of Recreational Skills to Contemporary Lifestyles** (3) George

Development of recreational skills; emphasis on local opportunities for recreational activities. Current trends in community recreational development and program planning. May be repeated for credit with permission of instructor. (Fall and spring)

157 **Dance Technique Theory** (3) **Withers**

Theoretical foundations of dance. Applied principles of kinesiology, analysis and practice of contemporary dance techniques. (Fall)

158 **Safety: Prevention, and Care of Sports Injuries** (3) George

Safety education, liability, prevention and care of sports injuries; related personnel, facilities, and equipment.

164 **Physiology of Exercise** (3) **Paup**

The physiological functions of the body and the effect of exercise on these functions. Prerequisite: HKLS 150 or permission of instructor. (Fall)

171 **Current Professional Literature and Competencies** (3) Snodgrass

Study of current literature with implications for HKLS specializations; use of library resources and retrieval systems; evaluation of professional competencies. Prerequisite: HKLS 103.

172 **International Experiences** (1 to 6) Staff

Travel to a foreign country for study of a specific topic.

173 **Independent Study** (1 to 3) Staff
Individually designed model for intensive study in an area of special interest. Prerequisite: demonstrated competency for independent work and permission of adviser and instructor. May be repeated for credit.

175 **Music for Dancers** (3) Staff
(Formerly Seminar in Music and Dance)
Rhythmic theory and analysis; resources in music and accompaniment principles for dance. Prerequisite: basic knowledge of rhythmic theory. (Spring, even years)

178 **Designing and Implementing Conferences and Meetings** (3) Nadler
Same as Educ 178. Use of design committees, steering committees, selection of resource people, site selection, exhibits, and relation to supplier personnel. Special attention to designing the core of the conference, and related conference activities.

184 **Workshop** (1 to 3) Staff
Titles announced in *Schedule of Classes*. May be repeated for credit with permission of advisor.

Third Group

202 **Conceptual Basis of Motor Learning** (3) Stallings
Variables of perceptual motor learning and performance; theories, concepts, and models of learning related to the development of motor skills. (Fall and spring)

205 **Perceptual-Motor Programs: Diagnostic-Therapeutic Techniques** (3) Stallings
Programs of perceptual-motor therapy and their basic assumptions and diagnostic-therapeutic techniques. (Spring)

230 **Advanced Concepts in Motor Development** (3) Snodgrass
Study and practice in techniques of critical observance and analysis of motor behavior throughout the life span, with special emphasis on period from birth to age eight and on the aged. (Fall)

232 **Current Issues in Elementary School Physical Education** (3) Snodgrass
Current philosophy, trends, and research; implications for curriculum, instruction, evaluation. (Spring)

239 **Administration of Recreation and Tourism Services for Special Populations** (3) Hawkins
Development of recreation and tourism opportunities for disabled, elderly, and other special populations; emphasis on administrative competencies in community organization, communications, consultation, program development, evaluation, and fiscal management. (Spring)

240 **Physical Education for the Handicapped** (3) Songster
Adaptive physical education for handicapped populations; development of competencies in diagnostic-prescriptive teaching, program design and evaluation, consultation, and communications. (Fa...

244 **Therapeutic Recreation Practice** (3) Park

Professional competencies for delivery of therapeutic recreation services to handicapped populations in clinically oriented settings. Emphasis on client assessment, activity analysis, treatment programming, and relationship of therapeutic recreation to total rehabilitation goals. (Spring)

245 **Medical Aspects of Disabilities and Handicapping Conditions** (3) Hawkins

Etiology, symptomology, and treatment of chronic and traumatic disorders associated with handicapping conditions; implications for programming and facility development as related to therapeutic recreation, adaptive physical education, and other therapies. (Fall)

249 **Tourism, Recreation, and the Quality of Life** (3) Hawkins

(Formerly HKLS 152, Environment, Leisure, and Quality of Life)

Impact of leisure on cultural development and social values; specific emphasis on psychosocial aspects of tourism and recreation. May be taken for undergraduate credit with permission of the instructor. (Fall)

250 **Administration of Travel and Tourism Services** (3) Shafer

Organization and management of a comprehensive system of tourism services utilizing educational, cultural and recreational resources; emphasis on public relations, personnel administration and supervision, cost-benefit analysis, fiscal management and managerial accountability. (Spring)

251 **Leisure Counseling** (3) Annand

The application of counseling and guidance techniques to leisure services. Emphasis on the impact of leisure on the individual and on the assessment of leisure functioning. (Spring)

252 **Group Dynamics, Interpersonal Relationships, and Supervision of Leisure Services** (3) Park

Overview of group dynamics, group processes, and interpersonal relationships as related to supervision. Theory, discussion, and group experiences in group process and supervisory techniques. (Fall)

256 **Sports Medicine** (3) Staff

Theory, practice, and research in diagnostic treatment, rehabilitation, and prevention of sports-related injuries.

260 **Tourism Development** (3) Riegert, Frechtling

Relationship of economic theory and principles to tourism development; applications of economic analysis techniques to the travel and tourism field. (Fall)

261 **Planning for Tourism** (3) Anzola-Betancourt

Integrated planning for travel and tourism organizations, financial and physical development for comprehensive tourism projects; consideration of basic concepts, approaches, and models. (Fall)

262 **Tourism Policy Analysis** (3) Edgell

Understanding components of tourism policy, development of tools for tourism policy analysis, and description of tourism organizations in the government and private sector. (Fall)

265 **Sports and Politics** (3) **Breen**

Methods of political analysis applied to sports policy; comparative approach to the study of the relationships between ideology, economic development, and the types and levels of government involvement in sports policy. (Spring)

270 **Philosophic Foundations of Dance** (3) **Johnson**

Examination and discussion of aesthetic theories in the arts and dance as a performing art, with application to criticism. (Spring)

271 **Dance Reconstruction** (3) **Staff**

Recreating the structure and dynamics of movement from dance scores. (Fall)

273 **Advanced Choreography** (3) **Staff**

Group or solo choreography. Course work includes responsibility for auditions, rehearsals, and presentation in concert. May be repeated once for credit. Prerequisite: HKLS 144 or equivalent. (Fall or spring)

276 **Dance in Society** (3) **Johnson**

Anthropological aspects of dance; emphasis on current research and literature.

280 **Advanced Workshop** (1 to 3) **Staff**

Workshops with emphasis on contemporary issues and problems, development of advanced professional competencies. May be repeated for credit with permission of advisor. (Fall and spring)

282 **International Experiences** (1–12) **Staff**

May be repeated for credit with approval of advisor.

283 **Practicum** (3 to 6) **Staff**

Field work, internship and/or instructional practice, including conference and or seminar. May be repeated once for credit with permission of advisor. (Fall and spring)

290 **Advanced Seminar** (1 to 3) **Staff**

May be repeated for credit with approval of advisor. (Fall and spring)

293 **Independent Study** (1 to 6) **Staff**

May be repeated for credit with approval of advisor.

296 **Systems Analysis of Tourism Services** (3) **Shafer**

Quantitative analysis, resource identification, design techniques, and other systems approaches applied to travel and tourism services. (Fall)

297 **Advanced Topical Studies** (3 or 6) **Staff**

Independent research and study pertinent to the needs of the student. Prerequisite: Educ 295 or permission of instructor. May be repeated once for credit with permission of the advisor. (Fall and spring)

299 **Thesis Research** (6) **Staff**

Fifth Group

701 **Experimental Course** (3)	Staff
721 **Experimental Course—Interdepartmental** (3)	Staff

INSTITUTE FOR SINO-SOVIET STUDIES

Members of the Institute

G. Sigur *(Director)*, C.F. Elliott, A. Gyorgy, H.C. Hinton, W.R. Johnson, Y. Kim, C.A. Linden, G.A. Olkhovsky, V. Petrov, C. Shih, M. Sodaro, R.B. Thompson, R. Thornton, S. Wolchik, R.Y. Yin

Associate Members of the Institute

J. Baclawski, J.J. Dziak, E.M. Hadley, J. Hardt, T. Hsia, W.H. Lewis, B. Ramundo, P.A. Smith, P. True

---

The Institute for Sino-Soviet Studies offers specialized graduate study in the School of Public and International Affairs. Students who lack background in Soviet and East Asian studies are required to take undergraduate courses selected by the advisor as prerequisite to graduate work. Related preparatory undergraduate courses include the following: Econ 101, 102, 133, 134, 169, 170; Hist 137, 138, 143, 144, 145, 146, 187, 188, 189, 195, 196; PSc 1, 9, 106, 107, 108, 131, 165, 168, 170, 173; Psyc 151.

For description of the objectives and programs of the Institute, see pages 178–79. For description of the courses listed below, see the appropriate departmental listing.

ECONOMICS

267 Seminar: *Soviet Economy* (3)	Hardt
268 Seminar: *Economic Theory and Development in Communist Countries* (3)	Hardt
269 *Economy of Communist China I* (3)	Yin
270 *Economy of Communist China II* (3)	Yin
271 *Economy of Japan* (3)	Hadley

GEOGRAPHY AND REGIONAL SCIENCE

265 Seminar: *Geography of the Soviet Union* (3)	Baclawski
266 Seminar: *Geographic Perspectives on Contemporary China* (3)	True

HISTORY

205 *Evolution of Nationalism in Eastern Europe* (3)	Petrov
206 *Revolution in Eastern Europe* (3)	Petrov
207 Seminar: *the Communist Party of the Soviet Union* (3)	Staff
215 *Transformation of the Socialist Commonwealth* (3)	Petrov
217–18 Seminar: *Russian and Soviet Thought* (3–3)	Staff

*232	**Comparative Communist Systems I (3)**	Wolchik
*233	*Comparative Communist Systems II* (3)	Wolchik
237	*Seminar: Soviet Foreign Policy, 1917-1960* (3)	Petrov
246	**Seminar: Modern Russian History (3)**	Staff
255–56	*U.S.-Soviet Strategic Relations Since World War II* (3–3)	Thornton
288	*History of Chinese Communism* (3)	Thornton
289	*Seminar: Modern Japanese History* (3)	Sigur
295–96	*The Modern Far East* (3–3)	Johnson
387–88	*Readings in the History of Sino-Soviet Relations* (3–3)	Thornton
395–96	*Readings in Modern Far Eastern History* (3–3)	Johnson

POLITICAL SCIENCE

207	*Readings in Socialism and Communism* (3)	Elliott Linden, Wolchik
208	*Readings in Marxism and Leninism* (3)	Elliott, Linden
230	*Comparative Government and Politics I* (3)	Kim, McClintock
231	*Comparative Government and Politics II* (3)	Kim, McClintock
*232	**Comparative Communist Systems I (3)**	Wolchik
*233	**Comparative Communist Systems II (3)**	Wolchik
263	**Communism in Non-Communist Europe (3)**	Sodaro
264	*The International Politics of Eastern Europe* (3)	Gyorgy
265	*Governments and Politics of Eastern Europe* (3)	Gyorgy
266	*Readings in Soviet Government and Politics* (3)	Elliott, Linden
267	*Soviet Government and Politics* (3)	Elliott, Linden, Wolchik
268	*Soviet Foreign Policy* (3)	Elliott
269	*Soviet Military Policy and Strategy* (3)	Wolfe, Elliott
270	*Politics of Mainland China I* (3)	Hinton
271	*Politics of Mainland China II* (3)	Hinton
272	*Foreign Policy of Mainland China* (3)	Hinton
275	*International Politics of the Far East* (3)	Hinton
276	*Government and Politics of Japan and Korea* (3)	Kim
291	*Colloquium: East Asia* (3)	Hinton
292	**Colloquium: Russia and Eastern Europe (3)**	Gyorgy

INTERNATIONAL AFFAIRS

See **Public and International Affairs.**

INTERNATIONAL RELATIONS—DOCTORAL PROGRAM

Doctoral Program Committee in International Relations

B.M. Sapin *(Chairman)*, R.M. Dunn, Jr., A. Gyorgy, W.R. Johnson, B. Nimer, B. Reich, P.F. Klarén

The Graduate School of Arts and Sciences offers an interdisciplinary program leading to the degree of Doctor of Philosophy in the field of international relations. (The School of Public and International Affairs offers a Master of Arts degree program in the area of international affairs.) The program is di-

* An interdepartmental course offered by the History and Political Science Departments.

rected by a committee whose members are drawn from the Economics, Political Science, and History Departments.

Required: the general requirements, pages 88–91, 97–99. Each program must include three disciplines and five fields of study. However, in some cases, cohesive and well-integrated programs based on two disciplines may be approved. Specific program guidelines are available from the Graduate School on request.

ITALIAN

See **Romance Languages and Literatures.**

JAPANESE

See **East Asian Languages and Literatures.**

JOURNALISM

Professorial Lecturers F.L. Dennis, H.E. Paine, P. Silberman, C.W. Puffenbarger
Associate Professors R.C. Willson, P. Robbins *(Chairman)*
Associate Professorial Lecturers R.L. Courage, J.P. McGill, E. Rogers, J. Coldsmith, W.L. Lawbaugh, W.R. Fonda, D.A. Sparks, C. Blount, W. Waterfall, R.R. Mueller, T.O. Cron, D. Haun, B.D. Colen
Assistant Professorial Lecturer T.W. Zito, Jr.

Bachelor *of Arts with a major in journalism (departmental)*—**The following requirements must be fulfilled:**

1. The general requirements as stated on pages **72–73, 79–85.** (Students planning to major in journalism should take Engl 11 rather than Engl 12 in satisfying the English composition requirement.)
2. Prerequisite courses—Engl 51–52 or 71–72; Jour **71–72; PSc 1 and 2 or 2 and 3.**
3. Required courses in the major—24 hours of second-group courses in Journalism, including (a) Jour 111, 196, 198; and (b) nine semester hours chosen from Jour 121, 125, 133, 135, 137, 138, 139, 151, 155.
4. Required as a minor area of concentration—a minimum of 18 semester hours of second-group courses, chosen in consultation with the major advisor, in one other department or field of study in Columbian College of Arts and Sciences.

Recommended electives: Econ 121, 142, 161, 162, 181–82; PSc 111, 112, 114–15, 116, 118, 119, 120; Psyc 115; SpDr 132, 133, 134, 135-36; Stat 53, 97, 105.

Departmental prerequisite: Jour 111 is prerequisite to **Jour 125, 133, 135, 137, 138, 139, 190 and 198.**

First Group

71–72 **Introduction to Mass Communication** (3–3) Willson

Jour 71: evolution of newspapers and other media in relation to political, social, and economic life; concept of press freedom. International students who lack knowledge of U.S. history should take

Hist 71–72 before taking Jour 71. Jour 72: mass media, problems of contemporary journalism, emphasis on federal government-media relations. (Academic year)

Second Group

111 Reporting (3) — Robbins, Colen

Gathering, evaluating, and writing news. Some typing required. Laboratory fee, $5. (Fall and spring)

115 **Newspaper Editing and Make-up** (3) — Coldsmith, Taylor

Preparation of news copy, pictures, and other graphic material for publication; evaluation of news, page layouts; newspaper make-up. (Fall and spring)

116 **Magazine Layout and Design** (3) — Paine

Layout, typography, and design for magazines, newsletters, house organs, and similar publications for associations, institutions, and industry. (Fall)

117 **Magazine Editing** (3) — Lawbaugh

The editor's responsibility to publisher and readers. Setting the editorial goals and planning content and production to meet them. Editing copy for general and specialized magazines. (Spring)

121 **Feature Writing** (3) — Willson

Free-lancing nonfiction articles, materials obtained through independent investigation. (Fall and spring)

125 Science Writing (3) — Staff

Writing science news for the mass media. (Spring)

133 **Advanced Reporting: Community News** (3) — Puffenbarger

Coverage and writing of local news. (Fall)

135 **Advanced Reporting: Consumer Affairs** (3) — Cron

Specialized training in the consumer news field. (Fall)

137 **Advanced Reporting: National Affairs** (3) — Silberman

Coverage and writing of federal government news. (Fall)

138 **Investigative Reporting** (3) — Puffenbarger

In-depth reporting in selected areas of political, economic, and social affairs. (Spring)

139 Advanced Reporting: Radio and Television News (3) — Cheely, Blount

Preparing news and public affairs programs for broadcast media. (Spring)

140 **Photojournalism** (3) — Fonda

Taking and processing photographs for publication, picture selection, cropping, captions. Students must purchase their own film and print paper. Laboratory fee, $25. Students who received credit for Art 23 or 24 cannot receive credit for Jour 140. (Fall and spring)

141 **Intermediate Photojournalism** (3) — Sparks, Haun

Advanced news and feature photography, editing, layout and photo essays. Students must purchase their own film and print paper. Laboratory fee, $25. Prerequisite: Jour 140 or Art 23–24. (Spring)

142 Advanced Photojournalism (3) **Rogers**

Picture stories and photo essays in black and white or color; emphasis on layout, captions, text. Students must purchase own film and print paper. Laboratory fee, $25. Admission by permission of instructor.

145 Principles and Problems of Public Relations (3) McGill

Principles, problems, and ethics of public relations for government agencies, commercial establishments, educational and other public institutions. Case histories of successful programs. (Fall and spring)

146 Government Information (3) Courage

Growth of information activities in government and the role of the information specialist. Writing and editing for government information operations. (Spring)

150 News Coverage in Washington (3) Staff

The Washington news beats, channels and sources of news in the nation's capital, uses and abuses of the media. Field trips to local news centers and press briefings. Guest lecturers from the Washington press corps.

151 Editorial Writing (3) **Robbins**

Techniques of editorial writing, conducting the editorial page, function of editorials and columns of news commentary in a free press. (Spring)

155 Critical Writing and Reviewing (3) Zito

Reviewing and commenting on the arts and entertainment for the mass media. (Fall)

160 The New Journalism (3) **Robbins**

A survey of the impact of fiction techniques on modern nonfiction reportage. Study of selected writers to identify influences and trends.

170 News Publication Management (3) Coldsmith

The business side of publishing. Study of the roles of advertising, circulation, promotion, accounting and administration, and mechanical departments in newspapers and other publications. (Spring)

190 Internship in Journalism (3)

Study of a journalistic medium in action by assignment to a Washington area news office. Admission restricted to senior journalism majors selected by a departmental committee. (Fall and spring)

196 Senior Project (3) **Staff**

Open only to journalism majors. Major journalistic effort undertaken in consultation with a member of the journalism staff. A written request describing the project must be presented to the staff member for approval, and filed with the student's advisor in the semester before registration. (Fall and spring)

198 Law of the Press (3) **Dennis**

Freedom of the press, censorship, legislative controls, publication as contempt of court, copyright, newsgathering agencies, labor law and the newspaper business, law of libel, privileged matter, fair comment on public characters, right of privacy. (Fall)

JUDAIC STUDIES

Committee on Judaic Studies

D.A. Altshuler *(Chairman)*, R.H. Davison, R.G. Jones, T.Z. Lavine, B. Nimer, D. Pollock, B. Reich, H.M. Sachar, M. Ticktin, J.E. Ziolkowski

Columbian College of Arts and Sciences offers an interdisciplinary program in Judaic Studies leading to the degree of Bachelor of Arts. This program is intended for students who wish to investigate the history, language, literature, religious and philosophical thought, and political and social experience of the Jewish people from the perspective of several academic disciplines. (Students who wish to concentrate on the religious aspects of Judaism and its relationship to the other religious traditions of the world may prefer to elect a major in religion with an emphasis on Judaism [see pages 432–33].)

Bachelor of Arts with a major in Judaic Studies (interdepartmental)—**The following requirements must be fulfilled:**

1. The general requirements as stated on pages 72–73, 79–85.
2. **Prerequisite courses—Clas 21–22, 23–24; Rel 9, 23.**
3. Required courses for the major (30 semester hours):

(a) Clas 103 or 104; Hist 158; PSc 179; Rel 113–14 or 115–16, 213 or 238.

(b) two meaningfully related courses selected from each of two of the following groups: I—Anth 177, 183; Art 111, 112; II—Clas 101, 102; Engl 175; III—Hist 107, 108, 110, 113, 114, 121, 122, 123, 124, 139, 140, 171, 172, 193, 194, 292, 293, 294; IV—Phil 111, 112, 113, 127, 131, 172; V—PSc 177, 178, VI—Rel 103, 104, 105, 107, 111, 122, 126, 137, 143, 144, 145, 146, 161, 162, 172, 174, 181, 184, 291, 292.

Students applying for the 90 hour degree program in Judaic Studies must, in addition to meeting the general requirements (see page 81), present evidence of exceptional preparation in the field of Judaism, provide strong recommendations from high school teachers and or counselors, and complete a satisfactory interview with the Committee on Judaic Studies.

LATIN AMERICAN STUDIES

Committee on Latin American Studies

M. Gordon *(Chairman)*, T.F. Carroll, J. Grunwald, R.L. Humphrey, Jr., P.F. Klarén, M. Koch-Weser, C. McClintock, P.A. Musgrove, L. Pérez, J.W. Robb, F.R. Siegel, G. Stuart, C.A. Wagner

Bachelor of Arts with a major in Latin American Studies (interdepartmental)—**The following requirements must be fulfilled:**

1. The general requirements as stated on pages 72–73, 79–85.
2. Prerequisite courses—Anth 2, Econ 1–2, PSc 1 or 3.
3. Required courses in related areas—Span 1–2, 3–4; or equivalent. (Span 9-10 or equivalent is recommended.)
4. Required courses in the major—(a) Anth 172, 184, or 185; Econ 185; Geog 161; Hist 163–64; PSc 183–84; and six semester hours chosen from Span 151–52, 155–56, 157–58, or other approved courses; (b) 18 semester hours, including an interdisciplinary seminar (287) in one of the following areas: anthropology, economics, geography and regional science, Hispanic literatures, history or political science. The required courses listed in (a) which are in the selected area may be included in computing the required 18 semester hours for (b).

***Master of Arts in the field of Latin American Studies*—See the School of Public and International Affairs, pages 170–76.**

Candidates for the degree of Doctor of Philosophy may elect Latin American history as an area of specialization in the field of history, Spanish American literature as an area of specialization in the field of Romance Languages and Literatures, or politics of Latin America as an area of specialization in the field of political science.

Courses Dealing with Latin America:

Anthropology—170, 172, 184, 185, 262, 268, 272, 282, 287
Economics—185, 233, 234, 251–52, 285, 286, 287
Geography and Regional Science—127, 161, 223, 261, 287
History—161, 163–64, 165, 166, 261, 262, 287
Political Science—183, 184, 283, 284, 285
Portuguese—31–32
Spanish—91–92, 151–52, 155–56, 157–58, 197–98, 253, 255, 256, 261, 264, 266, 287

LATIN

See Classics.

LITERATURE—INTERDEPARTMENTAL GRADUATE STUDIES

Committee on Interdepartmental Literature Studies

G. Ludlow *(French)*, N.N. Natov *(Slavic)*, J.A. Plotz *(English)*, J.A. Quitslund *(English)*, P.G. Sáenz *(Spanish)*, K. Thoenelt *(German)*

Interdepartmental Literature Studies seeks to provide graduate students in departmental literature programs with a greater understanding and appreciation of the interrelated aspects of Western literatures. The courses offered are under the direction of a committee whose members are drawn from the various modern literature departments within the University.

Courses are offered for Masters (non-thesis) and doctoral candidates in one or more of the following literatures: English, French, German, Russian, Spanish, and Spanish-American. Participating departments have agreed that candidates for graduate degrees may take a maximum of 6 semester hours of course work outside their own department as credit towards their Masters and doctoral degrees. Courses in foreign literatures are conducted in English and or the foreign language, at the discretion of the instructor. Undergraduate courses listed below may be taken for graduate credit. All courses are open to qualified undergraduate students as elective credit when taken outside of the major field. Students should consult with the departmental committee member and the course instructor before selecting courses.

For description of the courses listed below, see the appropriate departmental listing. Course offerings will not be restricted to the present listing.

ENGLISH

125–26 *Elizabethan Verse and Prose* (3–3)	Quitslund
133–34 *The Romantic Movement* (3–3)	Plotz
225–26 *Studies in 16th-Century Literature* (3–3)	Quitslund
233–34 *Studies in the Romantic Movement* (3–3)	Plotz

GERMAN

126 *France and Germany* (3) Thoene
161 *Studies in Modern Literature* (3) Steine

ROMANCE LANGUAGES AND LITERATURES

French

229–30 *Literary Renaissance in Europe* (3–3) Burk
242 *Novel and Theater in the 18th Century* (3) Ludlow

Spanish

137 *The Spanish Civil War and the Creative Artist* Barnet

SLAVIC LANGUAGES AND LITERATURES

128 *Dostoevsky: The Man and the Artist* (3) Natov
156 *Leo Tolstoy: His Life and Works* (3) Rowe

MANAGEMENT SCIENCE

Professors R.F. Ericson, G.L. Lippitt, D.D. Roman, P.B. Vaill, J. Harvey
Professorial Lecturers T. O'Connor, R.H. Walther, J.F. Coates, Z.A. Shavell, G.B.M. Hopper
Associate Professors J.F. McCarthy, Jr. *(Chairman)*, T.E. Shaughnessy, R.L. Holland, E.K. Winslow, W.E. Smith, W.W. Hardgrave, E.B. Adams, J.F. Coyne, E.H. Forman, C.J. Testa, S. Umpleby
Adjunct Associate Professor J. Lobuts, Jr.
Assistant Professor E.W. Hahn

Programs of study leading to the degrees of Bachelor of Business Administration, Master of Business Administration, Doctor of Business Administration, and Doctor of Public Administration are offered by the School of Government and Business Administration (see pages 131–61).

Second Group

107 Fundamentals of Behavioral Science (3) Vaill

Survey of behavioral science research and practice as related to management. Emphasis on the basic human processes which contribute to the functioning of organizations.

118 Introduction to Information Processing (3) Smith, Coyne, Forman

Basic principles, terminology, and methods of computer data processing. Introduction to the use of the computer as a tool through assignments illustrating typical problems encountered in business and government data processing. Assignments involve flow charting and computer programming in a higher level language (FORTRAN) and are run on the SGBA computer with the School's computer terminals. Laboratory fee, $25. (Fall and spring)

119 **Computer Programming for Information Systems** (3) Smith, Testa

COBOL programming for business and government data processing applications. For students already familiar with basic computer concepts, flow charting, and programming. Emphasis on practical computer applications in accounting and management information systems. Prerequisite: Mgt 118 or Stat 97. Laboratory fee, $25. [Fall and spring]

120 **Information Systems Development I** (3) Coyne, Smith

Assessment of the systems concept and its relationship to organizational information decision-making and management. Concepts and techniques involved in the initial development of new or revised computer-based information systems, i.e., systems analysis and design phases. Prerequisite: Mgt 118, 119, or permission of instructor. Laboratory fee, $25. (Fall and spring)

121 **Information Systems Development II** (3) Coyne, Smith, Testa

A further examination of the information systems development process, including concepts and techniques for assessment, selection, introduction, operation, and maintenance of a newly designed automated information system. Prerequisite: Mgt 120 or permission of instructor. Laboratory fee, $25. (Fall and spring)

122 **Special Studies in Information Systems** (3) Coyne, Smith

An independent or group-study project in information systems development which may involve faculty supervision, research, a case-study project, or field experience as an intern systems analyst in a local public or private organization. Prerequisite: Mgt 120 or permission of instructor. (Fall and spring)

Third Group

200 **Organization and Management** (3) Vaill

For graduate students in the MBA program. Overview of management and human systems concepts: organization theory, behavior, interpersonal communication. (Fall and spring)

201 **Advanced Administrative Management** (3) Adams, Ericson, Eastin, Brown, Page, Roman, Loeser, Vaill

Integrative approach to organization and management concepts, philosophy and theory as applied to all types of agencies and institutions. Evolution of management thought, functions, practices, and contemporary issues. (Fall and spring)

202 **Mathematics and Statistics for Management** (3) Hahn, Forman, Hardgrave

For graduate students in the MBA program. Mathematical and statistical concepts employed in the solution of managerial problems. Applications of functions, elements of calculus and linear algebra. Introduction to probability, frequency distributions, statistical inference, regression, and correlation. (Fall and spring)

204 **Quantitative Factors in Administration** (3) Hahn, Forman, Hardgrave

Survey of quantitative techniques in solution of management problems. Potentials and limitations of mathematical models and proper areas for their application; use of the computer in solving such

models. Linear programming, probability, decision-making under certainty, queuing and inventory models. Simulation. Prerequisite: Mgt 202, 218, or equivalent. Laboratory fee, $10. (Fall and spring)

207 **Human Behavior in Organizations** (3) Lippitt, Winslow, Harvey, Vail

Individual, group, intergroup, and other human behavior and development; application of behavioral science research to administration. Learning exercises and practical applications emphasized. (Fall and spring)

208 **Current Issues in Organizational Behavior** (3) Winslow

Study of behavioral factors relating to issues such as automation, ethics, interpersonal relations, organizational change, and social problems. Problems in behavioral science research. Prerequisite: Mgt 207. (Fall and spring)

210 **Behavioral Factors in the Process of Change** (3) Harvey, Winslow

Review of research, theory, and practice related to the process of human change. Students are provided the opportunity to apply new learning in various settings and to demonstrate competence in various modes. This course emphasizes the relationship between theory and practice. Prerequisite: Mgt 207 or permission of instructor. (Fall and spring)

212 **Organizational Development: Concepts and Methods** (3) Lippitt, Harvey, Vail

Primarily for doctoral students. Examination of different concepts of organizational structure, processes, and growth. Models of organizational change will be developed with a taxonomy of methods for initiating action to further organizational development. Prerequisite: Mgt 207, 210; or equivalent. (Fall)

213 **Consultative Processes in Organizations** (3) Lippitt, Harvey

Primarily for doctoral students. Examination through actual practice, as well as theory, of the nature of the helping process between one person or group and another person or group. Dynamics of the consulting process will be explored as well as role differences in internal and external consultation. Development of skill in the helping relationship will be furthered. Prerequisites: Mgt 207, 210; or equivalent. (Spring)

218 **Computer Programming with Business Applications** (3) Smith, Coyne

For designated students in the MBA program. Basic programming terminology, and organization of computer systems. Emphasis on developing a proficiency in the use of higher-level programming language via computer solutions to production management and accounting problems. Laboratory fee, $25.

225 **Introduction to Probability Theory and Applications** (3) Hardgrave, Hahn, Forman

(Formerly Managerial Statistics I)

Introduction to probability theory and its applications in management science and operations research; foundation course for later study of advanced probabilistic methods in operations research. Sample spaces, conditional probability, common distributions of random variables, simple stochastic processes. Prerequisite: Math 54, or equivalent.

227 **Mathematical Programming: Techniques and Applications** (3) Hardgrave, Forman, Hahn

Theoretical and applied consideration of linear programming and related methods. Mathematical and computational aspects of linear programming. Formulation of linear programming models. Studies of applications of linear programming. Introduction to integer programming algorithms, and heuristics. Prerequisite: Math 32 or 34 or equivalent. Laboratory fee, $10. (Fall)

228 **Techniques of Operations Research** (3) Hardgrave, Forman, Hahn

Survey and introduction to contemporary operations research techniques including nonlinear programming, dynamic programming, inventory and queuing models and simulation. Applications of such methods as models of common processes. Prerequisite: Mgt 226 or 227. (Spring)

229 **Modeling in Applied Operations Research** (3) Hardgrave

[Formerly Seminar: Management Science and Operations Research]

Advanced modeling exercises in applied operations research. Prerequisite: Mgt 228 or permission of instructor. (Spring)

230 **Administration of Research and Development** (3) Roman

Examination of international, political, and economic factors affecting the R&D environment; operational aspects; management problems in military, governmental, and industrial organizations; project selection, resource allocation, personnel, planning and control, measurement and evaluation. (Fall)

232 **International Research and Development** (3) Roman

International, political, social, and economic factors affecting international R&D policy; problems in industrial, governmental, and international organizations; world technological forecasting; resource allocation; technology transfer. Prerequisite: Mgt 230 or permission of instructor. (Fall)

233–34 **Technology Assessment Theory and Practice** (3–3) Coates

Mgt 233: the technology assessment concept. Methods for conducting assessments. Management of assessments. Evaluation of selected assessments. Mgt 234: planning and conducting a technology assessment. Prerequisite to Mgt 234: Mgt 233 or permission of instructor. [Academic year]

239 **Seminar: Administration of Research and Development** (1) Roman

Individual and/or group in-depth research projects dealing with various phases of research and development management. Topics will vary each time the course is offered according to the emerging technology, current operational problems and student interest. Prerequisite: 30 to nine semester hours of research and development management or permission of instructor. (Fall)

240 **Survey of Information Technology** (3) Adams, McCarthy

Management-oriented survey of key areas in information technology, including hardware, software, systems development, management and the computing milieu. Laboratory fee, $25. (Fall and spring)

241 **Management Information Systems Development and Application** (3) McCarthy

Contemporary theories and practices in the development of management information systems. Participation in the design of information

systems specifications. The roles of both management and systems design personnel in the systems development process studied and evaluated. Impact of management information systems upon the organization and its decision-making processes evaluated. Case studies. **Prerequisite: an introductory course in information technology, or permission of instructor.** **(Fall and spring)**

242 **Comparative Computer Systems** (3) Coyne

Characteristics and capacities of the range of information processing equipment in use today. Recent and prospective equipment and software development. Selection of computers and related software and equipment. Prerequisite: Mgt 241 or permission of instructor. (Spring)

243 **Management of Information Technology** (3) Adams

Advanced course emphasizing principles, practices, and trends in the management of information technology. Case studies. **Prerequisite: Mgt 241, 242; or permission of instructor.** **(Fall)**

244 **Information Systems and Telecommunication** (3) Coyne, Forman, Smith

Principles of telecommunications: the applications of telecommunications for the transmission of data between computers, between humans, between humans and computers. Telecommunications terminology, hardware and software considerations, legal and policy issues, recent developments, and calculations necessary for the specification and design of telecommunications systems. **(Fall)**

245 **Data Base Management** (3) Coyne, Smith, Testa

An in-depth approach to the understanding and use of the latest techniques for developing and implementing an effective data base system. Topics include data base organization, creation, and maintenance effort and economic justification; evaluation criteria; standardization of data base systems; impact of packaged data management systems; and an analysis of the current state of the art in data base development. Students will become proficient in the use of an actual data base management system. **Prerequisite: Mgt 118, 241. Laboratory fee, $25.** **(Spring)**

246 **Workshop in Data Base Management Systems** (3) Coyne, Forman, Smith, Testa

Analysis and solution of complex business information problems through commercially available data base management systems. Development of evaluation methodology, management of implementation strategies. Students will obtain "hands-on" experience with at least four major commercial systems. **Prerequisite: Mgt 245 Laboratory fee, $25.**

247 **Higher-Level Programming Languages for Business Applications** (3) Coyne, Forman, Smith

Use of major programming languages in business environments. Topics for each language will include: syntax and semantics, ease of learning, coding and debugging, documentation standards and maintenance, suitability for business problem area and projected usage, availability of language on large scale through mini-computers, typical business applications, conversion problems. **Prerequisite: Mgt 118 or equivalent. Laboratory fee, $25.**

248 **Design of On-Line Information Systems** (3) Coyne, Forman, Smith
Introduction to the analysis, design and implementation of on-line business information systems. Topics will include requirements analysis, functional specifications, file design, man-machine dialogue design, response time requirements, user psychology, human channel and buffer capacity. Prerequisites: Mgt 118 and 241 or equivalents. Laboratory fee, $25.

249 **Seminar: Information Technology** (3) Adams, McCarthy
Current problems in the design and implementation of computer-supported systems; emphasis on current state-of-the-art through discussion with leading experts in the field and analysis of literature. Prerequisite: Mgt 241, 242, 243, or permission of instructor. (Fall and spring)

260 **Introduction to General Systems and Cybernetics** (3) Ericson, Adams, Umpleby
Analysis of fundamental general systems and cybernetic concepts evolving in various branches of knowledge and academic disciplines, emphasizing their transcontextual and interdisciplinary nature, e.g., stability, equilibrium, homeostasis, feedback, regulation, equifinality, self-organization, variety, uncertainty, redundancy, paradox, first- and second-order cybernetics, and self-reference.

261 **Fundamentals of General Management Systems and Organizational Cybernetics (GEMSOC)** (3) Ericson, Adams, Umpleby
Dynamics of organization and management from a general systems and cybernetics viewpoint. Translation of GEMSOC research and theory into the world of organizational behavior and management practice. Prerequisite: Mgt 260 or permission of instructor.

263 **Case Studies and Field Research in GEMSOC** (3) Ericson, Adams, Umpleby
Investigation of existing organizational structures and ongoing management processes from a GEMSOC standpoint. Operational evaluations of firms and agencies, including intercontextual comparative studies. Prerequisite: Mgt 261

264 **GEMSOC Modeling and Simulation** (3) Ericson, Umpleby, Adams
Literature review and current practice analysis, modeling and simulation exercises. Continuous and discrete representations: system dynamics, set theory, kinematic graphs, information theory. Prerequisite: Mgt 261.

290 **Special Topics in Management Science** (3) Staff
Experimental offering: new course topics and teaching methods. May be repeated once for credit. (Fall or spring)

295 **Managerial Statistics I** (3) Hardgrave, Forman, Hahn
(Formerly Mgt 225)
Statistical methods and their applicability to management. Topics include sampling, estimation, hypothesis testing, regression and analysis of variance. The student will learn how to utilize computer software packages in applying the statistical techniques. Prerequisite: Mgt 202 and 218 or equivalent. Laboratory fee, $25. (Fall and spring)

296 **Managerial Statistics II** (3) Hardgrave, Forman, Hahn
(Formerly Mgt 226)
Statistical modeling of management applications. Topics include multiple regression, analysis of variance, analysis of covariance, survey design and forecasting. The student will learn how to utilize computer software packages for statistical modeling. Prerequisite: Mgt 295 or permission of instructor. Laboratory fee $25. (Fall and spring)

298 **Directed Readings and Research in Management Science** (3) Staff
(Fall and spring)

299 **Thesis Seminar** (3) Staff
(Fall and spring)

300 **Thesis Research** (3) Staff
(Fall and spring)

Fourth Group

Fourth-group courses are primarily for doctoral students. They are offered as the demand requires.

311–12 **Seminar: Public-Private Sector Institutions and Relationships** (3–3) Chitwood
An analysis and critique of alternative theoretical frameworks for describing, understanding, and predicting the nature, values, and actions of American public and private institutions. Problems, policy, and alternatives for structuring public and private institutional arrangements to meet the needs of society. (Academic year)

314 **Interpersonal and Group Dynamics** (3) Harvey
A laboratory education course employing experience-based learning designed to help participants learn about their impact on others and the dynamics of small group and intergroup behavior. Prerequisite: Mgt 207, 208, 210, or equivalent and permission of instructor.

315 **Interdisciplinary Problem Solving in Macro Systems: The Multocular Process** (3) Lippitt
Exploration of the utilization of cross-disciplinary representatives applying a particular problem-solving process when coping with complex problems. Such problems are defined as those having impact on large numbers of persons. Students will conduct experiments using the process, applying it to a real situation, and then to simulated scenarios. Prerequisite: Mgt 207, 208, 210, 212, or equivalent and permission of instructor.

325 **Seminar: Statistics and Probability** (3) Hardgrave
Special topics and advanced applications in statistics and probability, such as factor analysis, exploratory data analysis, or Box-Jenkins forecasting. May be repeated once for credit. Prerequisite: Mgt 294 and 295, or permission of instructor.

328 **Seminar: Operations Research** (3) Hardgrave
Special topics and advanced applications in operations research, such as fuzzy set theory, catastrophe theory, or Markovian decision processes. May be repeated once for credit. Prerequisite: Mgt 294 or permission of instructor

365 Research Seminar in GEMSOC Theory (3) — Ericson, Umpleby, Adams

Advanced seminar on recent advances in GEMSOC. Examination of the sources of systems concepts in traditional fields; extension of existing theory into new areas. Prerequisite: Mgt 261.

366 Philosophic and Policy Issues in Institutional Articulation (3) — Ericson

Need for greater institutional coherence of managerial decision-making in an "only one world" frame of reference. Systemic articulation and metasystemic integration; the planned evolution of more effective institutional forms. Institutional sovereignty, organizational morality, and human values; the search for general systemic optimality. Prerequisite: Mgt 261.

390 Philosophical Foundations of Administrative Research (3) — Lauter, Vaill

Philosophy of science as applied to research in administration. Topics include the nature and current problems of epistemology, the development and role of theories, and the relationship between theory, methodology, and empirical data. (Fall and spring)

391 Methodological Foundations of Administrative Research (3) — Lauter

Examination of the process of social science research. Use of models and theoretical frameworks in research, formulation of research questions, hypotheses, operational definitions, research design, sampling methods and data analysis approaches. Primary emphasis on the development of dissertation proposals. (Fall and spring)

398 Advanced Reading and Research (arr.) — Staff

Limited to students preparing for the general examination. May be repeated for credit. (Fall and spring)

399 Dissertation Research (arr.) — Staff

May be repeated for credit. (Fall and spring)

MATHEMATICS

Professors D. Nelson, T.P.G. Liverman *(Chairman)*, H. Kenyon, C. Taam, R.L.A. Bari, I. Katz, H.D. Junghenn

Adjunct Professor J. Efus

Professorial Lecturers D.M. Dribin, A. Tobler

Associate Professors W.A. Smith, D.R.K. Heaney, I.I. Glick, M.D. Green, M.E. Lee, E.A. Sims

Associate Professorial Lecturers S.L. Brodsky, M.E.I. Morris, C.M. Chamberlain, P.L. Hayes

Adjunct Assistant Professor M.M. Gupta

Assistant Professorial Lecturers W. Altman, B.T. Rice, E.J. Reiser, M.J. Lewis, L.A. Lee

Bachelor of Arts or Bachelor of Science with a major in mathematics (see [illegible] for University requirements [illegible] be satisfied).

The general requirements are listed on pages 72-73, 75-77.

Recommended courses—Math 31, 32, 33, 36; Math 301, a prerequisite to Math 31, may be taken after examination [illegible] requirements.)

3. Required courses in the major—a minimum of 24 semester hours of second-group courses in mathematics, including Math 106, 121, 123, 139 and 140. It is also strongly recommended that students take French, German, or Russian and mathematically related courses in such subjects as physics, statistics, economics and engineering.

Bachelor of Arts or Bachelor of Science with a major in applied mathematics (departmental)—The following requirements must be fulfilled:

1. The general requirements as stated on pages 72–73, 79–85.

2. Prerequisite courses—Math 31, 32, 33. (Math 30, a prerequisite to Math 31 may be waived upon examination before registration.)

3. Required courses in related areas:

(a) Stat 189–90.

(b) Eighteen semester hours to be selected, in consultation with the advisor, from the following areas of application. At least 12 semester hours must be chosen from one area, and the other six semester hours must be chosen from courses numbered 101 or higher. For courses in applied science, civil engineering, electrical engineering and computer science, engineering administration, mechanical engineering, and operations research, see the *School of Engineering and Applied Science Bulletin.*

Area I. Social and management sciences—courses chosen from ApSc 115, CE 183, 197; Econ 1, 2, 101, 102, 123, 199; EAd 261, 269, 281–82, 283, 284; EE 184, 283, 284, 285; Math 101, 102, 113, 124; OR 201, 209, 251, 252, 261, 277, 279, 281, 291; Stat 110, 117, 118, 131, 157–58, 159, 161–62, 165–66, 188, 197.

Area II. Engineering and physical sciences—courses chosen from Chem 111–12, 113–14; CE 120, 123, 140, 166, 167, 168, 185, 190, 191, 192, 193, 198, 201, 202, 203, 204, 205, 206, 207, 210, 220, 223, 252, 254, 258, 261, 262, 263, 275; Stat 117–118, 131, 157–58, 159, 161–62, 197; and any course offering in electrical engineering and computer science, mechanical engineering, or physics.

Area III. Computer sciences—courses chosen from EE 152, 153, 154, 157, 158; Math 101, 113, 124, 142, 153, 154, 157; Stat 110, 157–58, 161–62, 165–66, 197.

4. Required courses in the major—a minimum of 24 semester hours of second-group courses in mathematics, including Math 111, 112, 139, 140, 181–82. It is also strongly recommended that students take French, German, or Russian.

Master of Arts in the field of mathematics—Prerequisite: a bachelor's degree with a major in mathematics from this University, or an equivalent degree.

Required: the general requirements, pages 88–96. Students must complete 30 semester hours of approved course work, with or without a thesis, and must pass a comprehensive examination.

Master of Arts or Master of Science in the field of applied mathematics—Prerequisite: a bachelor's degree with a major in mathematics or a related field such as statistics, a physical science, engineering, or economics.

Required: the general requirements, pages 88–96. Course work is divided between mathematics courses and courses from one area of application—economics, engineering (civil, computer science, electrical, engineering administration, mechanical, or operations research), physics, statistics, or urban and regional planning. Courses in the chosen area of application are selected in consultation with the relevant department.

Candidates for the degree of Master of Arts must complete 30 semester hours of approved course work, including Math 299–300 *Thesis Research*, and must pass a comprehensive examination. At least 15 semester hours must be in mathematics courses, with no more than 6 hours of these from second-group courses. The remaining courses are chosen from the selected area of application. Theses are jointly supervised by the department of mathematics and the department concerned with the area of application.

Candidates for the degree of Master of Science must complete 30 semester hours of course work and must pass a comprehensive examination. At least

15 semester hours must be in mathematics courses, with no more than six semester hours from second-group courses. There is no thesis requirement.

Master of Science for Teachers—Prerequisite: A bachelor's degree; at least 12 semester hours or equivalent in mathematics courses, including the equivalent of Math 31; experience in teaching mathematics at the secondary school level. Required: 30 semester hours of approved second- or third-group mathematics courses, including Math 168.

Doctor of Philosophy in the field of mathematics—Required: the general requirements, pages 88–91, 97–99. The department doctoral program committee, after consultation with the student, will stipulate (1) courses which must be taken to fulfill the 48-semester-hour requirement leading to the General Examination, (2) the two languages, selected from French, German, or Russian, which must satisfy the foreign language requirement, and (3) the four areas of study in which the student must prepare for the General Examination. The doctoral program committee will appoint a Director of Research when the student has selected (preferably early in the program) one of the following research fields for the dissertation: functional analysis (abstract differential equations, functional equations, generalized functions, groups of operators), group representations, linear algebra (matrix theory), logic, measure and integration, ordinary and partial differential equations, theory of numbers, and topology (general topology, analytic topology, topological groups).

Bachelor of Arts in Education with a teaching field in mathematics—Prerequisite: the education curriculum, pages 111–12.

Required: the mathematics option and the professional courses listed on page 116.

First Group

***3 College Algebra** (3) — **Morris and Staff**

Equivalent to the standard two years of high school algebra with several additional topics. Prerequisite: one year each of high school algebra and high school geometry. (Fall and spring)

***6 Plane Trigonometry** (3) — **Morris and Staff**

Prerequisite: two years of high school algebra and one year of high school geometry, or Math 3 (or concurrent registration therefor). (Fall and spring)

9 General Mathematics I (3) — **Smith and Staff**

For students electing Math 9 and 10 as a terminal sequence. Logic, sets, Euclidean and non-Euclidean geometries. Algebra; calculus. Prerequisite: two years of high school mathematics. (Fall and spring)

10 General Mathematics II (3) — **Smith and Staff**

Probability and statistics. The computer. Modern mathematical systems; applications to the social sciences and humanities. Prerequisite: Math 9. (Fall and spring)

30 Precalculus (3) — **Bari and Staff**

Set theory, inequalities, basic analytic geometry, functions and relations. Polynomial, trigonometric, logarithmic and exponential functions. Prerequisite: Math 3 and 6; or one and one-half years of high school algebra, one year of high school geometry and one-half year of high school trigonometry; or equivalent. Prior to registration, new students must take a placement examination in algebra and trigonometry. (Fall and spring)

* The School of Government and Business Administration does not accept credit for this course toward the B.B.A.

31 Single Variable Calculus I (3) — Kenyon and Staff

Differentiation and integration of algebraic functions, exponentials and logarithms with simple applications. Analytic geometry. Prerequisite: Math 30 or equivalent.* (Fall and spring)

32 Single Variable Calculus II (3) — Kenyon and Staff

(Formerly Calculus of Several Variables)

Calculus of trigonometric functions. Techniques of integration. Infinite series; vectors; 3-dimensional analytic geometry. Prerequisite: Math 31. (Fall and spring)

33 Multivariable Calculus (3) — Kenyon and Staff

(Formerly Calculus of Vector Functions)

Vector-valued functions. Partial differentiation. Multiple integrals. Topics in vector calculus. Prerequisite: Math 32. (Fall and spring)

41 Calculus for Economists I (4) — Junghenn

Differentiation and integration of algebraic and elementary transcendental functions; marginal analysis for functions of one variable; optimization of functions of one variable applied to economics. Prerequisite: Math 30 or equivalent.* (Fall)

42 Calculus for Economists II (4) — Junghenn

Elementary linear algebra with economics applications, including input-output models; partial derivatives; multiple integrals; marginal analysis for functions of several variables; optimization of functions of several variables applied to economics; infinite series. Prerequisite: Math 41. (Spring)

†51 Mathematics for the Social and Management Sciences I (3) — Glick and Staff

Notion of function; graph of function; sequences; differential calculus of functions of one variable; exponential and logarithmic functions. New students must take a placement examination in algebra prior to registration. (Fall and spring)

†52 Mathematics for the Social and Management Sciences II (3) — Glick and Staff

Integral calculus of functions of one variable; functions of several variables; partial derivatives, maxima and minima, Lagrange multipliers; systems of linear equations and inequalities; matrix algebra; determinants. rudiments of linear programming. Prerequisite: Math 51 or 53. (Fall and spring)

†53 Mathematics for the Life, Social and Managerial Sciences I (4) — Liverman and Staff

Lecture (3 hours), laboratory (2 hours). Same topics as Math 51 with computer applications and orientation to Fortran programming. Computer-oriented motivation of mathematical concepts and applied problems in industrial areas for which mechanical computation is essential. New students must take a placement examination in algebra prior to registration.

†54 Mathematics for the Life, Social and Managerial Sciences II (4) — Liverman and Staff

Lecture (3 hours), laboratory (2 hours). Same topics as Math 52 with computer applications. Computer-oriented motivation of

* Math 30 may be waived by examination for students with adequate scores.
† Social and management science students with a strong record in high school mathematics are advised to take Math 31, 32, and 124 instead of Math 51 and 52.

basic mathematical concepts and applied problems in indicated areas for which mechanical computation is essential. Prerequisite: Math 33.

Second Group

101 Introduction to Mathematical Logic (3) Nelson

Introduction to proof theory and model theory of propositional and predicate calculi, computability, topics from foundations of mathematics. Open to sophomores with permission of department. Prerequisite: Math 32 or permission of instructor. (Fall)

102 Axiomatic Set Theory (3) Nelson

Zermelo-Fraenkel set theory, ordinals and cardinals, foundations of the real number system. Prerequisite: Math 101 or permission of instructor.

104 Mathematics and Human Thought (3) Dribin

Philosophical and historical aspects of mathematics and its interplay with other disciplines from antiquity to modern times. Prerequisite: two years of high school mathematics. (Spring)

106 Introduction to Topology (3) Kenyon and Staff

Prerequisite: Math 139 or permission of instructor. (Spring)

107 Introduction to Algebraic Topology (3) Bari

Prerequisite: Math 122 and 139, or permission of instructor.

111 Mathematics for Engineers and Physicists I (3) Henney and Staff

Differential equations. Laplace transform. Series solutions of differential equations. Boundary value problems. Prerequisite: Math 33. (Fall)

112 Mathematics for Engineers and Physicists II (3) Henney and Staff

Vector analysis. First- and second-order partial differential equations. Topics in complex variables. Prerequisite: Math 111. (Spring)

113 Graph Theory (3) Bari

Directed and undirected graphs; bridges, cutpoints, and blocks; connectivity; partitions; Eulerian and Hamiltonian graphs; planarity; coloring problems. Flow charts for computer applications. Prerequisite: Math 32. (Spring)

121–22 Introduction to Abstract Algebra (3–3) Lee and Staff

Several topics in elementary number theory; groups; rings (including polynomial rings), and fields. Open to sophomores with permission of department. Prerequisite: Math 32 or permission of instructor. (Academic year)

123 Linear Algebra (3) Lee and Staff

Theory of vector spaces, linear transformations, and matrices. Quadratic and bilinear forms, spectral decomposition. Prerequisite: Math 121. (Fall)

124 Introduction to Matrix Theory (3) Liverman and Staff

Operations on matrices, linear equations, matrix inversion, vector spaces, characteristic roots and vectors. Hamilton-Cayley Theorem. Systems of linear inequalities and nonlinear equations. Quadratic forms. Applications to economic, biological, and physical models. Prerequisite: Math 32 or permission of instructor. (Fall and spring)

125 Linear Programming (3) **Katz**

Simplex algorithm, degeneracy, the assignment problem, duality theorems, post-optimality, the transportation problem, integer programming, applications. Prerequisite: Math 123 or 124, or equivalent.

134 Introduction to Boundary-value Problems (3) **Staff**

Prerequisite: Math 111 or 142. (Spring, even years)

135 Projective Geometry (3) **Dribin**

Prerequisite: Math 123 or 124, or equivalent. (Fall, odd years)

139 Advanced Calculus I (3) **Taam and Staff**

Topology of R^n. Continuous mappings. Uniform convergence. Differentiable mappings. Prerequisite: Math 33. (Fall and spring)

140 Advanced Calculus II (3) **Taam and Staff**

Contraction maps, implicit function and differential equation theorems. Integration theory. Fourier series. Prerequisite: Math 139 or equivalent. (Spring)

141 Advanced Calculus III (3) **Stone and Staff**

Tensors, differential forms. Stokes theorem, introductory differential geometry. Prerequisite: Math 140.

142 Theory of Differential Equations (3) **Junghenn and Staff**

Linear and some nonlinear differential equations. Topics include existence theorems, stability, control theory, limit cycles, and applications to physics and ecology. Prerequisite: Math 139 and 123 or 124, or permission of instructor. (Spring)

153 Introduction to Numerical Analysis (3) **Gupta and Staff**

Introduction to fundamentals of numerical analysis using modern digital computers. Solution of linear systems and of ordinary differential equations. Interpolation polynomials. Iterative solution of nonlinear equations. Simple quadrature techniques. Prerequisite: Math 33 or equivalent. (Fall, even years)

154 Difference Equations (3) **Gupta and Staff**

Introduction to finite difference equations and their solution. Physical examples and analogies with differential equations are employed to motivate and apply the techniques developed. Generating functions. Analysis of error and stability characteristics. Prerequisite: Math 111 or 139, or equivalent. (Spring, odd years)

157 Introduction to Complex Variable Theory (3) **Henney and Staff**

Analytic functions. Power series. Contour integration and calculus of residues. Conformal mapping. Physical applications. Prerequisite: Math 139. (Spring)

168 Seminar: Curriculum Studies (3) **Barl and Staff**

Open only to candidates for the degree of Master of Science for Teachers, teachers for in-service training or students recommended by the department of education. Critical examination of secondary school mathematics, curricula, techniques and programs. Prerequisite: Math 31 and permission of instructor.

181–82 Seminar: Applied Mathematics (3–3) **Glick and Staff**

Prerequisite: Math 140, Stat 189–90, some knowledge of linear algebra, senior status as major in Applied Mathematics. (Academic year)

191 Special Topics (arr.) **Staff**

Admission by permission of instructor. May be repeated for credit. Offered upon demand.

195 Reading and Research (arr.) **Staff**

Under the personal direction of an instructor. Limited to mathematics and applied mathematics majors with demonstrated capability. Prior approval of instructor required. May be repeated for credit. (Fall or spring)

Third Group

Courses marked with an asterisk (*) are offered every year.

ALGEBRA

***201–2 Modern Algebra I and II** (3–3) Katz

Fundamental concepts of groups, rings, and fields. (Academic year)

203 Modern Algebra III (3) **Lee**

Galois theory and valuation theory. (Fall 1979 and alternate years)

204 Representation Theory (3) **Lee**

Representations of groups and algebras.

205 Matrix Theory (3) **Katz**

Topics chosen from the following: inequalities, non-negative matrices and their applications, infinite dimensional vector spaces, multilinear algebra, bilinear and quadratic forms.

206 Topics in Algebra (3) **Staff**

ANALYSIS AND APPLIED MATHEMATICS

***211 Complex Analysis I** (3) Henney and Staff

Topology of complex numbers; elementary functions; integrals; Cauchy's theorem; maximum modulus and Liouville theorem; Taylor and Laurent series; classification of singularities; contour integration; the residue theorem; continuation, multivalued functions, and branch points. Prerequisite: advanced calculus. (Fall)

212 Complex Analysis II (3) Henney and Staff

Harmonic functions, partial fractions, Mittag-Leffler theorem, entire functions, the Hadamard product theorem, the gamma function, Hurwitz's theorem, normal families of functions, The Riemann mapping theorem; analytic continuation, Riemann surfaces. Prerequisite: Math 211 or equivalent.

213 Applications of Complex Analysis (3) Liverman and Staff

Topics chosen from potential theory and conformal mapping, special functions, asymptotic expansions, steepest descent, stationary phase, and WKB methods, Fourier and Laplace transforms, Wiener-Hopf method, dual and singular integral equations. Prerequisite: Math 211 or an undergraduate course in complex variables. (Spring)

***214 Measure and Integration Theory** (3) Junghenn

Lebesgue measure and integration in abstract spaces. Probability measures. Absolute continuity; Radon-Nikodym theorem; measure on

product spaces. Fubini theorem. L^p spaces. Prerequisite: advanced calculus. (Spring)

*215 **Introduction to Functional Analysis** (3) Taam

Topological and metric spaces: Tychonoff theorem; completion of a metric space: Normed and Banach spaces: linear functionals and operators; Baire category theorem; principle of uniform boundedness; the closed graph theorem and Hahn-Banach theorem; Hilbert spaces; eigenvalues, eigenvectors, invariant subspaces, and projection operators; operational calculus of functions defined on the spectrum. Prerequisite: advanced calculus. (Fall)

216 **Banach Algebras and Spectral Theory of Operators** (3) Taam

Gelfand theory of commutative Banach algebras: function algebras, Stone-Cech compactification; application to the spectral theory of operators, spectral theorem for bounded and unbounded operators. Prerequisite: knowledge of measure and integration, introductory functional analysis, and Tychonoff and Stone-Weierstrass theorems.

217 **Introduction to Ordinary Differential Equations** (3) Glick and Staff

First course in ordinary differential equations; existence and uniqueness of solutions; continuity of solutions with respect to initial conditions; properties of linear systems. Prerequisite: advanced calculus. (Spring 1979 and alternate years)

218 **Topics in Ordinary Differential Equations** (3) Staff

Topics to be chosen from stability theory, non-linear oscillations, equations with delays.

219–20 **Techniques of Partial Differential Equations** (3–3) Liverman

Math 219. Linear first and second order equations. Applications to probability theory and mathematical physics. Prerequisite: knowledge of advanced calculus and rudiments of linear algebra and complex variables. Math 220. First-order equations and systems. Characteristics and characteristic surfaces. Variational and transform methods. Integral equations and boundary-value problems. Prerequisite: Math 219, knowledge of undergraduate linear algebra and analytic function theory. 1979-80 and alternate years.

221 **Calculus of Variations** (3) Staff

Introduction to the calculus of variations via the notion of the Fréchet derivative; the Euler equations; the Hamiltonian equations; sufficient conditions for a solution to exist; applications to mechanics and physics, control theory.

*222–23 **Introduction to Numerical Analysis** (3–3) Gupta

Elements of theory and practice of numerical analysis using modern digital computers; solution of linear systems and nonlinear equations; computation of eigenvalues and eigenvectors; least squares; curve fitting; interpolation techniques; numerical quadrature; solution of differential equations. Prerequisite: knowledge of advanced calculus. (Academic year)

224 **Generalized Functions and Operational Methods** (3) Liverman

Theory of Schwartz distributions. Operational calculus of generalized functions. Generalized function Fourier series. Fourier and Laplace transforms, applications to initial and boundary-value problems. Prerequisite: advanced calculus.

225 **Theory of Generalized Functions and Distributions** (3) Liverman
Fréchet and countable union spaces: structure, and properties of Schwartz distributions and Gelfand-Silov generalized functions; applications to explicit solutions and existence theory of ordinary and partial differential equations, nested Hilbert spaces; generalized Fourier transform. Prerequisite: Math 211 or permission of instructor.

226 **Control Theory** (3) Staff
Optimal control of linear systems, control of linear systems with convex cost functionals, the maximal principle and selected topics on control systems.

227–28 **Introduction to System Theory** (3–3) Staff
Analysis of discrete and continuous systems of various types. States and system dynamics and problems of control, optimization and stability. Prerequisite: background in advanced calculus and linear algebra.

229 **Mathematical Programming** (3) Katz
Simplex methods including discussion of degeneracy. Duality theory, applications to the transportation and assignment problems. Nonlinear programming, including dynamic and parametric programming.

230 **Topics in Analysis** (3) Staff

231 **Topics in Applied Mathematics** (3) Staff

232 **Topics in Numerical Analysis** (3) Staff

240 **Optimization and Nonlinear Programming** (3) Sullivan
A survey of the principal methods for nonlinear optimization including variable metric techniques and geometric programming. Prerequisite: linear algebra and advanced calculus.

241–42 **Mathematical Foundations of Stochastic Processes** (3–3) Jungheun
Fundamentals and applications of stochastic processes, beginning with a rigorous development of the requisite measure theory, probability theory, and Fourier analysis on R^n, and culminating in an in-depth study of Martingales, Markov processes, Brownian motion, and Poisson processes. Applications will be made to the life sciences, physics, engineering and gambling. Prerequisites: advanced calculus and linear algebra.

COMBINATORIAL MATHEMATICS

261 **Combinatorics** (3) Bari
Generating functions, recurrence relations, counting theorems. Selected topics. Prerequisite: undergraduate modern algebra and linear algebra.

262 **Graph Theory** (3) Bari
Selected topics in graph theory from introductory topics to problems currently of research interest. (Spring)

263 **Topics in Combinatorial Mathematics** (3) Staff

LOGIC

*271 **Introduction to Mathematical Logic** (3) Nelson
Propositional and predicate calculus, first order; syntax, formation

rules, semantics, axioms, proof and deduction, object vs metalanguage, deduction theorem, compactness theorem, Gödel-Henkin completeness theorem, Craig's interpolation theorem, Beth's definability theorem. First-order recursive arithmetic, incompleteness and undecidability. (Fall)

272 **Topics in Logic** (3) Nelson

Selected topics from recursive function theory, model theory, set theory, or proof theory.

TOPOLOGY

*281–82 **General Topology** (3–3) Kenyon

General topological spaces, separation axioms, compactness and connectedness. Metrization, uniform spaces, and complete spaces. (Academic year)

283–84 **Topological Groups** (3–3) Staff

General theory of topological groups: uniform structures on groups, products and inverse limits. Locally compact groups, classical linear groups and Lie groups. Prerequisites: General topology including uniform spaces, linear algebra, and real and complex variables. Prerequisites: General topology including uniform spaces, linear algebra, and elementary group theory.

285 **Topological Vector Spaces** (3) Junghenn

Vector space topologies, linear manifolds, metrizability and complexification. Locally convex topological vector spaces, projective and inductive topologies, barrelled and bornological spaces. Prerequisites: General topology including uniform spaces, linear algebra and real and real and complex variables. (Spring)

287 **Differentiable Manifolds I** (3) Glick

Differentiable manifolds, tangent vectors, sub-manifolds, imbeddings and immersions, vector fields and differential equations on manifolds, tensors and differential forms, Lie derivatives, orientability.

288 **Differentiable Manifolds II** (3) Glick

Manifolds with boundary, integration on manifolds, Stoke's theorem and the divergence theorem, the Brouwer fixed point theorem, deKham groups, Riemannian manifolds, geodesics, curvature.

289 **Topics in Topology** (3) Staff

Fourth Group

*398 **Advanced Reading and Research** (arr.) Staff

Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

*399 **Dissertation Research** (arr.) Staff

Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

MICROBIOLOGY—GRADUATE PROGRAMS

Professors R. Hugh, E.M. Lerner II *(Research)*, L.F. Affronti (Chairman), K. Huang

Associate Professors M. Reich, P.D. Kind, Y. Chu *(Research)*
Associate Professorial Lecturer R.F. DeGiovanni-Donnelly

Master of Science in the field of microbiology—Prerequisite: a bachelor's degree with a minor in biological or physical sciences from this University, or an equivalent degree. The undergraduate program must have included the following courses or equivalent: BISC 14–42, Chem 14–42, 151–52, 153–54, Math 30, 31 (31 may be taken concurrently with the graduate program), Phys 1, 2.

Required: the general requirements, pages 88–96. A total of 30 semester hours is required, 24 hours of course work and six hours of thesis (Micr 299–300). The course work must include Micr 211 (if not taken prior to admission), plus Bioc 221–22, Micr 277–78; and completion of the biostatistics tool requirement. The remaining academic work should consist of graduate-level courses selected with the approval of the department.

Doctor of Philosophy in the field of microbiology—Required: the general requirements, pages 88–91, 97–99. Candidates must fulfill the tool requirement by completing biostatistics and by either passing a reading knowledge examination in French or German, or completing satisfactorily six semester hours in an approved tool option such as electron microscopy. The General Examination covers at least four fields, two of which must be in microbiological disciplines.

Research fields: clinical microbiology, determinative bacteriology, immunochemistry, immunology, microbial genetics, microbial pharmacology, microbial physiology, and virology.

211 Microbiology (4) **Staff**

Survey of bacteria, viruses, rickettsiae, fungi, parasites, and immunological concepts. Prerequisite or concurrent registration: Bioc 221–22, or other biochemistry course, and permission of instructor. Laboratory fee, $20. (Fall)

212 Pathogenic Bacteriology (3) **Hugh**

Principles of bacteriology and pathogenic characteristics of bacteria with emphasis on pathogenesis, prevention, and control of bacterial diseases of man. Prerequisite: Micr 211 or equivalent. Laboratory fee, $20. (Spring)

214 Tissue Cell Culture and Somatic Variation (3) **Piper**

Fundamental aspects of the culture of animal, plant, and insect cells. Specialized techniques and applications of tissue culture procedures. Prerequisite: Micr 211 or equivalent. (Spring)

215 Medical Parasitiology (2) **Staff**

Study of host-parasite relationships. Clinical recognition of important parasites in medicine. (Fall)

225 Microbial Physiology I (3) **Reich**

Morphology and biochemistry of various microorganisms with emphasis on bacteria. Prerequisite: Bioc 221–22, Micr 211, or equivalent. (Fall)

226 Microbial Physiology II (3) **Reich, DeGiovanni-Donnelly**

Effects of physical and chemical agents on microorganisms with emphasis on antibiotics. Prerequisite: Micr 225 or permission of instructor. (Spring)

229 Immunology (3) **Kind, Affronti**

Lecture course. Fundamental immunologic concepts. Antigens, antibodies, antigen-antibody reactions in vitro and in vivo, and the im-

mune response. Prerequisite: Micr 211 or permission of instructor. (Fall)

230 **Immunology Laboratory** (2) Kind, Affronti

Serologic and immunologic procedures as applied to clinical and research situations emphasized. Prerequisite or concurrent registration: Micr 229 or permission of instructor. Laboratory fee, $20. (Fall, odd years)

231 **Immunobiology** (1) Affronti, Kind

Study of immunological functions of reticulo-endothelial tissues, theories of autoimmunity, graft rejection, tumor immunity, delayed hypersensitivities and immunogenetics. Clinical faculty discuss relevant aspects of immunobiology. Prerequisite: Micr 201* or 229, and permission of instructor. (Fall)

233 **Virology** (3) Stokes†

Biochemical, genetic, and pathogenic characterization of viruses. Prerequisite: Micr 211 or equivalent. (Fall)

234 **Virology—Laboratory** (2) Stokes†

Laboratory complement to Micr 233. Prerequisite or concurrent registration: Micr 233. Laboratory fee, $20. (Fall)

235 **Systematic Bacteriology** (2) Hugh

History of bacterial classification, international rules of bacterial nomenclature, development of bacterial classification based on relationships, characteristics of bacterial groups. Prerequisite: Micr 212 or equivalent. (Fall, odd years)

‡240–41 **Biomedical Instrumentation** (4–4) Staff

Same as Bioc 225–26 and Phys 223–24. Comprehensive study of theoretical and practical application of biomedical instrumentation to the separation, identification, and quantification of materials of interest to biomedical scientists. Laboratory fee, $40. (Academic year)

251 **Clinical Laboratory Bacteriology** (3) Hugh

For graduate students; open to medical students. Detection and identification of bacterial agents which cause diseases in humans. Comparative isolation and identification methods, emphasis on interpretation and significance of laboratory observations. Prerequisite: Micr 212 or equivalent. (Fall, even years)

255 **Clinical Virology** (1) Huang

General principles of virology; emphasis on clinical situations. Prerequisite: Micr 212 or equivalent. (Fall)

257 **Experimental Immunochemistry** (3) Affronti

Biochemical and physicochemical characterization of antigens and antibodies. Prerequisite: Bioc 221–22 or equivalent, Micr 229. Laboratory fee, $20. Limited enrollment. (Spring, even years)

258 **Microbial Genetics** (2) De Giovanni-Donnelly

Survey of microbial systems that depict basic concepts of genetic principles. Prerequisite: Micr 211 or equivalent. (Spring)

---

* For description of Micr 201 see the *School of Medicine and Health Sciences Bulletin*.
† G.V. Stokes is Assistant Professor of Microbiology, G.W.U. School of Medicine and Health Sciences.
‡ An interdisciplinary course offered by the Biochemistry, Microbiology, and Physiology departments.

260 Cellular Immunology (1) Kind

Advanced seminar in cellular aspects of the immune response. Content differs each time course is offered. May be repeated for credit. Prerequisite: Micr 250. [Spring]

277–78 Seminar: Microbiology (1–1) Staff

Required of graduate students. [Academic year]

293 Special Topics in Microbiology (arr.) Staff

Selected topics in microbiology. May be repeated for credit. [Fall and spring]

295 Research in Microbiology (arr.) Staff

Content differs each time the course is offered; may be repeated for credit. [Fall and spring]

299–300 Thesis Research (3–3) Staff

[Fall and spring]

398 Advanced Reading and Research (arr.) Staff

Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. [Fall and spring]

399 Dissertation Research (arr.) Staff

Limited to Doctor of Philosophy candidates. May be repeated for credit. [Fall and spring]

MUSEUM STUDIES—GRADUATE PROGRAM

Committee on Museum Studies

A.D. Andrews, R.K. Evans (*Chairman and Acting Director of Program*), V.K. Golla, R.L. Humphrey, M.P. Lader, B. Mergen, R.K. Packer, C.R. Rose

The Committee serves the Museum Studies Program in an advisory capacity. Its members are drawn from several departments of the University and from the Smithsonian Institution.

The Graduate School of Arts and Sciences offers an interdepartmental program leading to the degree of Master of Arts in the field of museum studies. This program provides students with a broad background in museum studies, including a variety of specialized approaches to museum work with emphasis in conservation, museum administration and collections management, and exhibiting.

The program is designed primarily to prepare students to work with historical and ethnic collections. Students whose principal career interests are in art collections and galleries should apply for candidacy in the program for the Master of Arts in the field of art history with a concentration in museum training offered by the Art Department. Students whose career interests are primarily in curatorial positions with botanical materials should apply for candidacy for the Master of Arts in the field of anthropology, with a concentration in museum training. Students whose career interests are primarily in curatorial positions with historical materials should apply for candidacy for the Master of Arts in the field of American studies, with a concentration in museum training. Students whose career interests are in museum education should apply for candidacy in the program for the Master of Arts in Teaching—Museum Education, offered by the School of Education and Human Development.

Students applying for candidacy in the Museum Studies Program must meet all general requirements for admission to the Graduate School of Arts and Sciences, including a baccalaureate degree with a major, or its equivalent, in anthropology, art history, American studies, or natural science. In addition, the student should have taken at least six credit hours in each of these fields and at least nine credit hours in one of them, other than the student's undergraduate major, or must show equivalent preparation. There are additional prerequisites for specialization in ethnographic or archeological conservation.

Master of Arts in the field of museum studies—Required: the general requirements, pages 88–96. The degree requires a minimum of 42 hours of course work. At least 15 hours of course work must be in an academic core discipline, for example, American studies, anthropology, biological sciences, geology and paleobiology, public administration, or an appropriate interdisciplinary combination. At least 15 hours of course work must be in museum studies courses in conservation, museum administration, and exhibiting. Six to 12 hours must be in a museum internship in the Washington area or elsewhere. The student must pass a comprehensive examination based on course work and submit a research paper of publishable quality. In addition, the student must fulfill the tool requirement by passing a reading examination in an approved foreign language, an approved course in statistics or computer programming, an approved course in organic chemistry for those specializing in conservation, or other approved courses.

MUSEUM STUDIES

Third Group

201 Introduction to Museum Studies — **Evans**

An introduction to the field of museum work—the history and purposes of museums; the types and variety of museums: natural science, social science, and history museums; the organization and functioning of museums: the role of museums in the community, the nation, and the world; collections, curation, research, conservation, exhibition, and education. (Fall)

216 Collections Management — **Collier**

General principles of collections management—preservation, storage, maintenance, and documentation of ethnographic, archeological, and natural science specimens. Topics include storage hardware systems, environmental effects on collections, inventory control, registration systems, and data storage and retrieval. (Spring)

MUSEUM STUDIES COURSES OFFERED BY OTHER DEPARTMENTS

Conservation:

Art/Anth 292: *Introduction to Conservation*
Art/Anth 293: *Conservation Laboratory Techniques*
Art/Anth 211: *Seminar: Problems in Conservation*
Art/Anth 212: *Advanced Conservation Techniques*

Administration:

Art 129–30: *Principles of Museum Work*
Art 213: *Museum Administration and Governance*
Art 214: *Museum Administration and Trusteeship*

Art 217–18: *Problems in Museum Work*
Educ 310: *Museum Studies*
Educ 311: *Museum Audiences*

Exhibiting:

Art 209–10: *Exhibition and Display Design*
Anth 264: *Seminar: Museum Techniques*
AmCv/Anth 270: *Seminar: Museum Exhibiting*
Anth 291: *Seminar: Museology*
Educ 311: *Museum Audiences*

Internships:

Art 201–2: *Museum Projects*
Art 271–72: *Museum Techniques*
Anth 290: *Advanced Museum Research*
AmCv 251: *Museum Research and Education*
Educ 312: *Internship in Museum Education*

MUSIC

Professors C. Steiner *(Chairman)*, R. Parris
Professorial Lecturer E. Meyers
Associate Professor N.A. Tilkens
Adjunct Assistant Professors M.C. Tolson *(Piano)*, R.J. Guenther
Assistant Professorial Lecturer B. Feinstein
Studio Lecturers in Applied Music S.K. Kim *(Piano)*, M. McNabb *(Piano and Organ)*, M. Peris *(Piano)*, C.A. Rachlin *(Piano)*, C.O. Dash *(Voice)*, S.H. Prussing *(Voice, Director of Choral Activites)*, J.E. White *(Voice)*, R. Parnas *(Violin and Viola)*, R.A. Norris *(Guitar)*, R.C. Raffaelle *(Guitar)*, D.C. Jarvinen *(Cello)*, J.S. Martin, Jr. *(Cello)*, N.M. Irvine *(Bass)*, W.E. Fuhrman *(Flute)*, W.H. Mann *(Flute)*, T.P. Perazzoli *(Flute)*, R.O. White *(Oboe)*, W.R. Wright *(Clarinet and Saxophone)*, L. Lipnick *(Bassoon)*, R. Odmark *(French Horn)*, J. DeWitt *(Trumpet)*, R.H. Kraft *(Trombone and Recorder)*, T.H. Wardlow *(Percussion instruments)*, B.R. Seidman *(Harp)*, M.K. Kuper *(Flute)*, M.C. Sislen *(Guitar)*, A. Lee *(Voice)*, P. Gieseler *(Voice)*, J.P. Ramo *(Guitar)*, E.M. Guenther *(Organ)*, D. Basch *(Violin)*, G. Kreplin *(Guitar)*

Bachelor of Arts with a major in music *(departmental)*—The following requirements must be fulfilled:

1. The general requirements as stated on pages 72–73, 79–85.
2. Prerequisite courses—Mus 2, 5 6, six hours of applied music lessons, a minimum of four semesters in music ensemble groups (or evidence of equivalent experience).
3. Required courses in related areas (except for music therapy)—12 hours of one foreign language (French, German or Italian recommended).
4. Required courses in the major—Mus 101, 102, 103, 104, 131–32, 138; six additional hours of applied music courses. Students preparing for graduate work or professional concentration in music may elect a further program of specialization in music literature, theory, or applied music. (Music theory majors must meet departmental requirements for proficiency in piano; applied music majors must perform a complete public recital or the equivalent in solo performances.)

Master of Arts in the field of [illegible]—Prerequisite: a bachelor's degree with a major in music, or an equivalent degree.

Required: the general requirements, pages 88–96. The program of study consists of 30 semester hours of course work including a thesis (six semester hours).

Master of Music in the field of music theory, music composition, conducting, or applied music—Prerequisite: a bachelor's degree with a major in music or an equivalent degree.

Required: the general requirements, pages 88–96. The required second- and third-group course work is as follows:

1. *In the field of music theory*—Thirty semester hours of course work including a thesis (six semester hours) demonstrating research ability in theoretical, creative, or analytical techniques.

2. *In the field of music composition*—Thirty semester hours of course work including a creative thesis of the composition in large form, properly prepared for performance (chamber music, a symphonic form, or a choral work with orchestral accompaniment) including a written theoretical, formal, and harmonic analysis of the work.

3. *In the field of conducting*—Thirty semester hours of course work including a thesis (six semester hours) demonstrating research ability in theoretical, creative, or analytical techniques. The requirements also include an acceptable public conducting performance.

4. *In the field of applied music*—Thirty semester hours distributed as follows: (a) 12 semester hours of applied music in the area of concentration; (b) 12 semester hours of music theory and music history and literature courses; and (c) a thesis (six semester hours). The thesis consists of a public recital and performance before a departmental committee (such a recital and performance must be representative of an extensive and well-rounded repertory, performed on a professionally accepted artistic level), and delivery of an historical and analytical lecture on the musical content of the program demonstrated. Leadership in an ensemble performance (opera or oratorio for voice); and a written report on some approved theoretical area related to the student's concentration.

Bachelor of Arts in [illegible] with a teaching field in music—Prerequisite: the education curriculum, pages 111–12.

Required: the music, cultural, and professional courses listed on page 118.

MUSIC THEORY, HISTORY, AND LITERATURE

First Group

1 Elements of Music Theory (3) Staff

Notation, scales, keys, intervals, terms, rhythms, and chord structure. (Fall and spring)

2 Ear-training (3) Staff

Melodic and harmonic dictation, ear-training, sight singing, elementary keyboard harmony. (Spring)

3 Introduction to Musical Understanding (3) Steiner, Tilkens

Introductory history of musical styles, related to listening; study of music materials and media. (Fall and spring)

4 Survey of Music Literature (3) Steiner

Introductory study of musical forms, structures, and textures, and analysis of selected literature. (Spring)

5–6 Harmony (3–3) Guenther

Triads, inversions; chord analysis, construction, and progression; part-writing, modulations, altered chords. Prerequisite: Mus 1 or satisfactory passing of placement examination. [Academic year]

7 Music of Nonwestern Cultures (3) Tilkens

Introductory survey of the basic systems and styles of music in the major cultures of the Eastern Hemisphere and Africa.

8 History of Jazz (3) Staff

Introduction to the styles, composers, and performers of jazz music from its origins to the present.

Second Group

101–2 History of Music I (3–3) Tilkens

Development of music in the Western world from the early Christian era through the Renaissance. [Academic year]

103–4 History of Music II (3–3) Tilkens

Development of Western music from the Baroque to the present. [Academic year]

109 Orchestra Literature (3) Steiner

Survey of the history and styles of orchestra literature, analysis of representative works.

110 Chamber Music Literature (3) Steiner

Survey of the history and styles of chamber music literature, analysis of representative works. [Fall]

121 The Opera (3) Feinstein

Survey of the history and styles of opera, analysis of representative works. [Fall]

125 Keyboard Music Literature (3) Tilkens

Survey of the history, style, and major content of the keyboard literature from the 16th century to the present. [Spring]

131–32 Advanced Theory (3–3) Parris

Practice in 18th-century contrapuntal writing and analysis; chorale preludes, inventions, and fugues. Prerequisite: Mus 5–6 or equivalent. [Academic year]

133–34 Composition (3–3) Parris

[Academic year]

135 Counterpoint (3) Parris

Study and practice of 16th-century contrapuntal techniques. [Fall]

137 Orchestration (3) Parris

Instrumental scoring.

138 Form and Analysis (3) Parris

Analysis of musical forms in representative masterworks. [Fall]

151 Conducting (3) Steiner

Techniques of conducting, score reading, rehearsal procedures, and the interpretation of standard musical literature; practice in conducting. [Spring]

160–61 **Electronic Music** (3–3) Meyers
Tape and electronic techniques, synthesizer use, and acoustical principles. (Academic year)

173 Piano Pedagogy (3) Tolson
Principles, materials, and methods of piano teaching. (Spring)

199 **Independent Research** (3) Staff
Under the guidance of an assigned instructor. Open only to qualified music majors. May be repeated for credit. (Fall and spring)

Third Group

203 **Bibliography and Research Methodology** (3) Guenther
(Fall)

205 **Music of the Baroque Period** (3) Tilkens
(Formerly Mus 105)
Study of the musical styles, techniques, and literature from 1600 to 1750.

206 **Music of the Classic Period** (3) Guenther
(Formerly Mus 106)
Study of styles, techniques, and literature from the 18th-century schools through Haydn, Mozart, and Beethoven. (Spring)

207 **Music of the Romantic Period** (3) Guenther
(Formerly Mus 107)
Study of the musical styles, backgrounds, and literature from Schubert through the 19th century.

208 **Music of the 20th Century** (3) Guenther
(Formerly Mus 108)
The principal schools, techniques, developments, and trends of the 20th century. (Spring)

231–32 **Composition** (3–3) Parris
May be repeated for credit. (Academic year)

234 **Seminar: Performance Practices in Selected Areas** (3) Staff

237 **Seminar: Analytical Studies in Music Theory** (3) Guenther
(Fall)

238 **Seminar: Analytical Studies in Music History** (3) Tilkens
(Fall)

239 **Independent Research** (3) Staff

251–52 **Advanced Conducting** (3–3) Steiner
(Spring)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

APPLIED MUSIC

All applied music courses are offered both fall and spring, and may be repeated for credit.

Mus 51, 52, 53, 54 and 55 do not include individual lessons and do not require a supplementary fee. All other applied music courses include individual lessons and require a supplementary fee, as follows:

1. One-semester-hour courses: individual lessons of one-half hour a week, supplementary fee, $75.

2. Two- or three-semester-hour courses: individual lessons of one hour a week, supplementary fee, $100.

Supplementary fees for applied music courses are nonrefundable after the first three weeks of the fall and spring semesters. Supplementary fees are different for courses offered during the summer sessions. Consult the Music Department for details.

The supplementary fee is waived for graduate degree candidates in music and full-time undergraduate music majors.

First Group

Required practice: three hours a week for one-semester-hour courses and six hours a week for two-semester-hour courses.

11 **Piano** (1)	Staff
12 **Piano** (2)	
13 **Voice** (1)	Staff
14 **Voice** (2)	
15 **Organ** (1)	McNabb, E. Guenther
16 **Organ** (2)	
17 **Violin** (1)	Basch, Parnas
18 **Violin** (2)	
19 **Classical Guitar** (1)	Staff
20 **Classical Guitar** (2)	
21 **Viola** (1)	Parnas
22 **Viola** (2)	
23 **Cello** (1)	Martin, Jarvinen
24 **Cello** (2)	
25 **Bass** (1)	Irvine
26 **Bass** (2)	
27 **Flute** (1)	Perazzoli, Fuhrman, Kuper
28 **Flute** (2)	
29 **Recorder** (1)	Kraft
30 **Recorder** (2)	
31 **Oboe** (1)	R. White
32 **Oboe** (2)	
33 **Clarinet** (1)	Wright
34 **Clarinet** (2)	
35 **Saxophone** (1)	Wright
36 **Saxophone** (2)	
37 **Bassoon** (1)	Lipnick
38 **Bassoon** (2)	
39 **French Horn** (1)	Odmark
40 **French Horn** (2)	
41 **Trumpet** (1)	Staff
42 **Trumpet** (2)	
43 **Trombone** (1)	Kraft
44 **Trombone** (2)	
45 **Percussion** (1)	Wardlow
46 **Percussion** (2)	

47 Harp (1) — Seidman
48 Harp (2)
49 Tuba (1) — Kraft
50 Tuba (2)

51 Orchestra (1) — Steiner
Preparation and performance of orchestral literature. Prerequisite: audition before director. (Fall and spring)

52 Instrumental Ensemble (1) — Steiner
Chamber ensemble groups approved by audition. (Fall and spring)

53 Chorus (1) — Prussing
Preparation and performance of choral literature. Prerequisite: audition before director. (Fall and spring)

54 Chamber Choir (1) — Prussing
Small vocal groups and chorus participation. Prerequisite: audition before director. (Fall and spring)

55 Band (1) — Staff
Concert band, stage band and brass ensemble. (Fall and spring)

Second Group

Departmental prerequisite: audition to meet departmental requirements.
Required practice: six hours a week for one-semester-hour courses and 12 hours a week for two-semester-hour courses. In addition, three semester-hour credits include master performance classes and recital preparation.

111 Piano (1) — Staff
112 Piano (3) — Staff
113 Voice (1) — Staff
114 Voice (3) — Staff
115 Organ (1) — Staff
116 Organ (3) — Staff
117 Orchestral Instrument (1) — Staff
118 Orchestral Instrument (3) — Staff
119 Classical Guitar (1)
120 Classical Guitar (3)

Third Group

Required practice: 12 hours a week for three-semester-hour courses and 18 hours a week for two-semester-hour courses. In addition, all persons include supervised ensemble preparation and required concert solo performances.

211 Piano (3)
213 Voice (3)
215 Organ (3)
217 Orchestral Instrument (3)

NEW COURSES IN GENERAL AND INTERDISCIPLINARY STUDIES—700 SERIES

Committee on Curriculum: W. E. Schmidt *(Chairman)*
Two sets of course numbers have been reserved to identify new courses initiated by this program, in Education Voluntary and the School of Education and Human Development:

701 (General Studies)
721 (Interdisciplinary Studies)

In each case the course title will be completed by a brief description of the topic of the individual course. Because the courses will be changing constantly, interested students should consult the Schedule of Classes for the current semester. The courses will be listed with the other offerings of participating departments.

The 701 number will be used to designate courses taught by individual faculty members. They will explore topics not normally included in departmental offerings, and will utilize insights and methods from disciplines in addition to those usually identified with the sponsoring department. The 721 number will designate upper level courses in which faculty from two or more departments investigate a topic of mutual academic interest.

PATHOLOGY—GRADUATE PROGRAMS

Professors H. Sidransky (*Chairman*), F.N. Miller, S. Bloom
Associate Professors S.G. Kent, B.C. Zook (*Comparative*), Y. Al-Doory, F.P. Abramson, C.T. Garrett
Assistant Professor J.M. Orenstein

Programs of study leading to the degree of Associate in Science (*Medical Laboratory Technique*) are described in the *School of Medicine and Health Sciences bulletin*.

Master of Science *in the field of mycology*—Prerequisite: a bachelor's degree with a major in biology, botany, chemistry, or zoology from this University or an equivalent degree. The undergraduate program should have included the following courses or their equivalent: BiSc 11-12; Chem 11–12, 151–52, 153–54.

Required: the general requirements, pages 88–96. Candidates must complete 24 hours of course work plus 8 hours of thesis (Path 299.299). With the approval of the advisor and the Graduate School, candidates may take 36 hours of course work without a thesis. Candidates admitted to a non-thesis program are required to take Biol 221–22. The remaining 6 hours must consist of graduate-level courses selected with the approval of the advisor.

Doctor of Philosophy *in the field of pathology*—Prerequisite: one of the following degrees from a recognized professional school: Doctor of Medicine (M.D.), Doctor of Veterinary Medicine (D.V.M.), or Doctor of Dentistry (D.M.D.). In exceptional cases applicants with other backgrounds in the life sciences may be accepted.

Required: the general requirements, pages 88–91, 97–99, including 30 semester hours of approved graduate course work. One year of experience in pathology at the University Hospital, equivalent to Path 299, may be accepted for a maximum of 24 semester hours of graduate course work. Other experience may satisfy the eligibility requirements of the appropriate national certifying board, as the American Board of Pathology in the case of the M.D., the American Board of Veterinary Pathologists in the case of the D.V.M., and the American Board of Oral Pathology in the case of the D.D.S.

Areas of study: general pathology, comparative pathology, human pathology, ophthalmic pathology, veterinary pathology, biochemical pathology, cardiovascular pathology, and nutritional deficiency pathology.

Third Group

203–4 **Pathology** (4–4) **Staff**

General introduction to concepts of disease. Pathology of organ systems correlated with symptoms and physical signs. Gross and

microscopic study of diseased tissues. Case studies. Limited enrollment. Prerequisite to Path 203: Anat 202, 203, 204, 205, or equivalent. Prerequisite to Path 204: Path 203. (Academic year)

*205 **Comparative Pathology I** (3) Zook

An introduction to the study of disease in vertebrates, comparison with disease in man. Mechanisms by which various agents provoke illness, body defensive reactions. Illustration of common diseases of various species, including material from captive wild animals. Recommended: courses in antomy, histology, and physiology.

†210 **Comparative Pathology Laboratory** (2) Zook, Montali‡

Participation in an autopsy service involving captive wild animals and comparison of diseases in various animal species with those in man. Limited to 4 students. (Fall)

†215 **Perinatal Pathology Laboratory** (2) Kent

Special assignments for dissection and study. (Fall)

220 **Medical Mycology** (2 or 4) Al-Doory

Study of pathogenic fungi, mycotic diseases and their clinical aspects. (Fall)

221 **Medical Mycology Laboratory** (1) Al-Doory

Laboratory complement to Path 220. Prerequisite or concurrent registration: Path 220. Laboratory fee, $20. (Fall)

222 **Opportunistic Mycoses** (2) Al-Doory

Study of the opportunistic fungal infections and their serological, clinical, and therapeutic aspects. Emphasis on identification of fungi and evaluation of laboratory findings. (Spring)

272–73 **Seminars in Mycology** (1–1) Al-Doory

Conferences and discussions on current topics and latest developments in medical mycology. May be repeated for credit. (Academic year)

275 **Research in Mycology** (2 to 4) Al-Doory

Participation in experimental studies in mycotic diseases. Research in laboratory medicine on topics related to medical mycology. May be repeated for credit. (Fall and spring)

276 **Seminar in Experimental Pathology** (1) Staff

Presentations on current topics in experimental pathology. (Fall and spring)

†277 **Anatomic Pathology Clerkship I** (arr.) Staff

A practical course in gross human anatomy and pathology. Prerequisite. Anat 201 or equivalent. Students may spend up to 24 weeks full-time on the necropsy and surgical pathology services, receiving one semester hour of credit for each four-week period. (Spring)

†281 **Anatomic Pathology Clerkship II** (arr.) Staff

A practical course in gross and microscopic human pathology. Prerequisite: Path 203 4 or equivalent. Students spend up to 24 weeks

* [illegible] Professors of Pathology and Biological Sciences

† Open to limited number of graduate students, with permission.

‡ [illegible] Assistant Clinical Professor of Pathology at the G.W.U. School of Medicine and Health Sciences

full-time, or the equivalent part-time, on the necropsy and surgical pathology services, receiving one semester hour of credit for each four-week full-time period. (Spring)

*283 **Anatomic Pathology Clerkship III** (arr.) Staff

Necropsy and surgical pathology service. Prerequisite: Path 203–4 or equivalent. Five semester hours of credit for each four-week period. Students may receive up to 30 semester hours of credit for six months full-time.

*295 **Comparative Pathology II** (arr.) Zook, Casey,† Montali

Participation in veterinary pathology service, including wild and domestic animals. Prerequisite: Path 203–4 or equivalent. Five semester hours of credit for each four-week period. Students may receive up to 30 semester hours of credit for six months full-time.

299–300 **Thesis Research** (3–3) Staff

(Fall and spring)

Fourth Group

398 **Advanced Reading and Research** (arr.) Staff

Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff

Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

PHARMACOLOGY—GRADUATE PROGRAMS

Professors H.G. Mandel *(Chairman)*, V.H. Cohn, P. Mazel, R. Hertz (Research), S.E. Fabro *(Research)*, J.A. Straw, P. Klubes
Professorial Lecturers J. Axelrod, E. Costa
Associate Professor F.P. Abramson
Assistant Professors A.M. Suria, R.J. Anderson

Master of Science in the field of pharmacology—Prerequisite: a Bachelor of Arts or Bachelor of Science degree. The undergraduate program must have included the following courses, or equivalent: B.Sc 41 42; Phys 1, 2; Chem 21–22, 151–52, 153–54. One year of calculus and a course in physical chemistry are also recommended.

Required: the general requirements, pages 86–96, including Biol 221–22, Phsl 201, 212; Phar 203, 205–6, 299–300

Doctor of Philosophy in the field of pharmacology—Required: the general requirements, pages 88–91, 97–99

Research fields: biochemical pharmacology, cancer chemotherapy, developmental pharmacology, endocrine pharmacology, molecular pharmacology, neuropharmacology, neurotoxicology, cardiovascular pharmacology, pharmacokinetics, pharmacology of drug abuse, and physiological disposition of drugs.

Second Group

114 **Drugs and the Consumer** (3) Cohn and Staff

General concepts of drug action in the body. Action mechanism of

* Limited number of graduate students with permission
† Joint Walter Reed & George Washington University Professor of Pathology at the G.W.U. School of Medicine and Health Sciences

some specific prescription and nonprescription drugs, including contraceptives; tranquilizers and [illegible] drugs; hayfever, headache, and cold remedies; [illegible] biotics; vitamins. Issues related to development and marketing of drugs, drug safety, drug advertising, generic versus trademark drugs, drug use in sports, drug use during pregnancy, smoking and health. No science prerequisites. Limited enrollment. (Fall)

115 **Nonmedical Use of Licit and Illicit Drugs** (3) Cohn and Staff
(Formerly Drug Abuse [illegible])
Psychological and sociological bases of motivations and other nonmedical use of drugs, pharmacological and [illegible] aspects of drug action on both the brain and peripheral organ systems, legal and societal implications of and responses to the nonmedical use of drugs, prevention and treatment of drug dependence. Lectures and discussions on [illegible] narcotics, central nervous system stimulants and depressants, marijuana, hallucinogenic and psychedelic drugs. There are no science prerequisites. (Spring)

Third Group

203 **Fundamental Principles of Pharmacology** (3) Cohn and Staff
Basic principles of pharmacology including drug-receptor interactions, structure activity relationships, pharmacokinetics, membrane phenomena, cellular control mechanisms, drug toxicity. Admission by permission of the instructor. (Fall)

205 **Pharmacology** (8) Cohn and Staff
Lectures, laboratory, conferences on interaction of drugs and biological systems as a basis of rational disease therapy. Prerequisite: Phar 203, courses in biochemistry and physiology, or approval of department. (Fall)

215 **Adolescent Drug Abuse** (3) Cohn and Staff
Offered off campus through the College of General Studies. Primarily for teachers, counselors and other professionals. Multidisciplinary lectures and discussions concerning the physiological and psychological effects of narcotics, central nervous system stimulants and depressants, alcohol, and hallucinogenic and psychedelic drugs; psychosocial factors leading to adolescent drug abuse; legal implications of drug abuse; prevention, control, and treatment of drug abuse. (Fall and spring)

254 **Frontiers in Pharmacology** (1) Mazel and Staff
Recent advances and research in pharmacology. Presentations by laboratory scientists from neighboring institutions. (Spring)

256 **Molecular Pharmacology** (2 or 3) Mandel and Staff
Current theory on drug action, especially chemotherapeutic agents, at molecular level. Effects of drugs on biosynthetic processes of the cell with respect to DNA, messenger RNA, transfer RNA, ribosomes, protein, cell wall, and [illegible] antibiotics. Factors which alter action of drugs, such as drug interactions and resistance. (Spring)

258 **Cancer Chemotherapy** (1) Mandel and Staff
Mechanisms by which drugs inhibit the growth of tumor cells. (Spring, even years)

260 **Endocrine Pharmacology** (1) Hertz and Staff
Lectures and seminars on recent advances in the pharmacology and mechanisms of action of various hormones. (Spring, odd years)

267 **Pharmacological Research** (arr.) Staff
Research with staff members. May be repeated once for credit toward a Master of Science degree. (Fall and spring)

269 **Pharmacology Seminar** (1) Mazel and Staff
Recent advances in pharmacology. Content differs each time the course is offered; may be repeated once for credit. (Fall and spring)

272 **Physiological Disposition of Drugs** (3) Cohn
Fate of drugs in biological tissue. Absorption, distribution, chemical alteration, excretion of drugs; physical, chemical, and biological factors affecting these processes. Prerequisite: Phar 205–6 or permission of the instructor. (Spring, even years)

275–76 **Advanced Topics in Pharmacology I-II** (1–1) Anderson and Staff
Lectures and seminars on advances in mechanisms of drug action, pharmacology of new drugs, theoretical aspects of pharmacology, laboratory techniques. (Academic year 1979–80 and alternate years)

277–78 **Advanced Topics in Pharmacology III-IV** (1–1) Anderson and Staff
Continuation of Phar 275–76. (Academic year 1980–81 and alternate years)

279 **Special Topics in Pharmacology** (arr.) Staff
Selected aspects of drug action. Content differs each time the course is offered; may be repeated once for credit. (Fall and spring)

280 **Neuropharmacology** (2) Suria and Staff
Fundamental principles. Electrophysiological and biochemical techniques. Neurotransmitters and their pathways in the central nervous system. Drug effects on neurotransmitter pathways. Biochemical basis of mental disease. Prerequisite: Phar 205–6 or equivalent. (Spring, odd years)

295 **Reading and Research** (arr.) Staff
Independent study for students preparing for the Master of Science degree. May be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

Fourth Group

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

PHILOSOPHY

Professors T.Z. Lavine, R.H. Schlagel *(Chairman)*
Associate Professors W.B. Griffith, R.S. French
Assistant Professor R.P. Churchill

Bachelor of Arts with a major in philosophy (departmental)—The following requirements must be fulfilled

1. The general requirements as stated on pages 72-78, 79-85. (Students should consult the departmental adviser regarding courses to be taken in satisfying the requirements for meaningful initiation into the social sciences and the natural and mathematical sciences.)

2. Required courses in related areas—six semester hours of literature courses selected from Chinese, Classics, English, French, German, Italian, Slavic, or Spanish (Class 71, 72, or Engl 191-92 recommended); six hours selected from art history, music history, or religion; six hours in history (Hist 39-40 recommended).

3. Required courses in the major—Phil 111, 112, 113; nine semester hours selected from Phil 131, 151, 152, 153, 161, 162, 163; 12 semester hours selected from Phil 172, 182, 183, plus six additional semester hours of second-group philosophy courses.

For students expecting to continue in graduate school, it is recommended that they include in their program of study 12 semester hours of introductory French, German, or Greek language courses.

Master of Arts in the field of philosophy—Prerequisite: a bachelor's degree with an undergraduate major in philosophy at this University, or an equivalent degree. The undergraduate program should have included the following courses or their equivalent: Phil 111, 112, 113, 121, 131, and 152.

Requires the general requirements, pages 86-96. The program of study consists of a minimum of 30 semester hours of second- and third-group courses with or without a thesis. A Master's Comprehensive Examination is required in two areas of philosophy: the history of philosophy; problems of philosophy and contemporary philosophy. Candidates must pass a reading knowledge examination in French, German or Greek.

Master of Arts in Special Studies with an area of concentration in philosophy and social policy—An interdisciplinary program which brings the conceptual, historical, and analytical-logical skills of philosophical inquiry to bear upon contemporary problems of social policy. Prerequisite: a bachelor's degree from an accredited college or university. Students are expected to have completed the prerequisites to graduate courses.

Requires the general requirements, pages 86-96. Two options are available to the candidate: (1) a minimum of 24 semester hours of graduate courses and (2) a minimum of 30 semester hours of graduate course work, which may include up to six hours of thesis. Phil 371, 372, 373, and 375 are required for all students and are recommended for students electing to write a thesis. The remainder of the program in both options must include a minimum of approved courses in the philosophy and sciences, with no more than one-third taken in any one department. Courses may be selected from the School of Education, the School of Law, the School of Government and Business Administration, and the School of International Affairs. Each candidate must pass a Master's Comprehensive Examination based on the preceding interdisciplinary components of the student's program of study. Prospective candidates should consult Professor Roderick French, director of the program.

First Group

45 Introduction to Logic (3) — Churchill
Deduction, induction, and legal reasoning; emphasis on recognition of fallacies and practical applications of logic. (Spring)

50 Introduction to Philosophy (3) — Staff
Readings from major philosophers and study of philosophic positions from Plato to Sartre. (Fall and spring)

71 Philosophy and Literature (3) — Lavine
Philosophical foundations of psychoanalytical psychiatry, existentialism, and Marxism and their expression in literature, e.g., in the works of Mann, Kafka, Camus, Sartre, Hesse, Gide, and Koestler. (Spring)

*01 East Asia—Past and Present (3) — Johnson and Associated Faculty
An interdisciplinary course, introducing the student to a comprehensive and integrated understanding of the civilization and present problems of East Asia.

Second Group

111 History of Ancient Philosophy (3) — Staff
History of Western philosophy from early Greece to the early Middle ages. (Fall)

112 History of Modern Philosophy (3) — Churchill
History of Western philosophy of the 17th and 18th centuries (Descartes to Kant). (Spring)

113 19th-Century Philosophy (3) — Lavine
European philosophy from Kant to German Romanticism, Fichte, Hegel, Kierkegaard, Schopenhauer, and Nietzsche. (Fall)

121 Symbolic Logic (3) — Griffith
Systematic study of the principles of valid inference with attention to the development of skill in formal analysis and evaluation of arguments and to the elementary theory of formal systems. (Fall)

†127 **Theories of History** (3) — Lavine
Major philosophies of history: Judeo-Christian, linear progressive, historicist, Hegelian-Marxian dialectical, cyclical (Vico, Spengler, Toynbee), and social-scientific (Comte, Weber). Contemporary problems of historical knowledge. (Fall)

131 Ethics (3) — Griffith
Main types of ethical theory: egoistic, utilitarian, self-realization, conscience, existentialism. Applications to contemporary problems. (Spring)

132 Social Philosophy (3) — Lavine
Social philosophies from Locke to contemporary theorists. (Spring)

---

* An interdepartmental course offered by the Philosophy, East Asian Languages and Literatures, Economics, Geography and Regional Science, History, Political Science, and Religion Departments.

† An interdepartmental course offered by the Philosophy and History Departments.

133 **Philosophy, Nonviolence, and the Problem of War** (3) Churchill
Problems of war in relation to morality, theories of human aggression and violence; nonviolence and pacificism as alternatives to war; doctrine of just war. (Summer)

142 **Philosophy of Law** (3) Churchill
Systematic examination of fundamental concepts of law and jurisprudence, special emphasis on the relationship between law and morality. (Fall)

151 **Myth, Science, and the Modern Mind** (3) Schlagel
Comparison of the mythical and scientific outlook; emphasis on the development and nature of scientific concepts, methodology, and explanation from Copernicus to Einstein. (Fall)

152 **Knowledge, Truth, and Reality** (3) Schlagel
Inquiry into the basis and structure of knowledge, the problem of perception and independent reality, and the meaning and criteria of truth. (Spring)

162 **Aesthetics** (3) Staff
Nature of aesthetic experience, problems of appreciation and criticism in the arts, and theories of artistic creation. (Spring)

172 **American Philosophy** (3) Staff
Philosophies of Peirce, Royce, James, Dewey, and Santayana as representatives of American thought. (Fall)

192 **Contemporary Philosophy: Analytical** (3) Churchill
The two dominant movements of recent Anglo-American philosophy, logical positivism and British ordinary language philosophy, as represented by Russell, G. E. Moore, Wittgenstein, Ryle, Ayer etc. (Fall)

193 **Contemporary Philosophy: Phenomenological** (3) Griffith
Turn of the century intellectual crisis and Husserl's phenomenological movement; the phenomenological existentialism of Heidegger and Sartre; existential Marxism in Sartre and Merleau-Ponty; Hermeneutics of Ricoeur and Gadamer. (Spring)

197 **Contemporary Ideologies and Utopias** (3) Lavine
A philosophic analysis of recent ideologies and utopias in Europe, the United States, and Asia; the sociological, psychological, political and intellectual origins of ideologies; their theoretical structure and their practical functions; the relation of ideologies to social change; the significance of the diffusion of ideologies to other cultures; ideologies and the problem of value-relativity. (Fall)

198 **Philosophy of the Social Sciences** (3) Lavine
Philosophic issues relating to theory, methodology, and application of the social sciences. Analysis of one major contemporary social scientific project. (Spring)

199 **Readings and Research** (3) Staff
(Fall and spring)

Third Group

201–2 **Readings and Research** (3–3) Staff
Advanced reading and creative investigation of special problems. [Academic year]

216 **Seminar: Kant** (3) **Schlagel**
Critique of Pure Reason. (Fall)

221 **Seminar: Logic of Choice** (3) **Griffith**
Logical analysis and appraisal of three basic types of arguments used in justifying social choices: arguments leading to optimal and rational outcomes, arguments concerning principles, and arguments for fair decision rules. (Spring)

231 **Ethics and Economic Policy: Justice and Equality** (3) Griffith
Economic policy viewed from the perspectives of ethics and economic theories with special focus upon the issue of income distribution in the United States. (Fall)

251 **Seminar: Philosophy of Science** (3) Schlagel
Philosophical implications of quantum mechanics.

252 **Seminar: Epistemology** (3) Schlagel
Cognitive development and human understanding.

271 **Mankind and Nature in Public Policy** (3) French
[Formerly Phil 195]
Relation of philosophical conceptions of man and nature to national policies of growth and development in selected periods of American history. (Fall)

272 **Pragmatic Naturalism and American Social Policy** (3) Staff
Examination of pragmatic naturalism as a criterion and reconstruction of American institutions: evaluation of philosophical and theological alternatives in relation to the task of current technological and ecological problems. (Spring)

299–300 **Thesis Research** (3–3) **Staff**

PHYSICAL SCIENCE

See **Chemistry.**

PHYSICS

Professors H.H. Hobbs, J. Pfeiffenberger, O. Heinemann, A.J. Zindler, F. Peaty
Associate Professors W.C. Parke, N.K. Kleitchmann (Chairman), D.R. Lehman, M.F. Taragin
Assistant Professors E.P. Harper *(Visiting)*, J.R. Peverley *(Visiting)*

Bachelor of Arts or Bachelor of Science with a major in physics. Departmental—The following requirements must be fulfilled:
The general requirements are stated on page [illegible].
Prerequisite courses—Phys 8, 14, 15, 16; Chem 11–12; Math 31, 32, 33
Courses in related area—Stat 37 or 63 or 67
Courses in the major—Phys 151, 161, 162, 165, 166; Hum 207, 208

Master of Arts in the field of physics—Prerequisite: a bachelor's degree with a major in physics at this University, or an equivalent degree.

1. The Master's degree program *with* thesis—Required: the general requirements, pages 95–96, and 30 semester hours of course work in physics, including Phys 241, 242, 243–44, 235, 236, 299–300, plus one of the following: Phys 241, 243, 244, 245, or 251–52.

2. The Master's degree program *without* thesis—Required: the general requirements, pages 95–96, and 36 semester hours of course work in physics and mathematics including Phys 241, 242, 243–44, 235, 236, plus one of the following: Phys 241, 243, 244, 245, or 251–52.

A reading knowledge of a foreign language, or the successful completion of Stat 197, with a grade of *A* or *B* is a tool requirement.

Doctor of Philosophy in the field of physics—Required: the general requirements, pages 88–91, 97–99, and the successful completion of one of the two following tool requirement options: (a) two foreign language reading examinations or (b) one foreign language reading examination and completion of Stat 197 with a grade of *A* or *B*.

Research fields: experimental solid state physics (electrical conductivity of solids, defects in crystals, magnetic properties of solids at low temperatures, magnetic resonance, Mossbauer effect, superconductivity), and theoretical physics (elementary particles, field theory, general relativity, magnetic and optical properties of solids, molecular structure, nuclear and photonuclear reactions).

Bachelor of Arts in Education with a teaching field in physics—Prerequisite: the education curriculum, pages 111–12.

Required: the physics option and the professional courses listed on page 116.

Departmental Prerequisite: Phys 3, 14, 15, 16; two semesters of calculus or equivalent, and consent of a departmental advisor are prerequisite to all second-group courses.

Undergraduate departmental advisors: W. Parke, D. Lehman, N. Khatcheressian, M. Taragin

Graduate departmental advisors: H. H. Hobbs, J. Eisenstein, O. Bergmann, A. J. Zuchelli, F. Prats

ASTRONOMY

First Group

9–10 Introduction to Astronomy (3–3) Hobbs

Lecture (2 hours), recitation (1 hour), laboratory (2 hours). Classical through modern astronomy with introduction to basic principles underlying astronomical systems and observations. Primarily for nonscience majors. Laboratory fee, $11 a semester. (Academic year)

11–12 Introduction to Astronomy (2–2) Hobbs

Same as Phys 9–10 without the laboratory. (Academic year)

21 Modern Cosmology (3) Staff

Nonmathematical treatment of cosmology and related subjects from astronomy and physics. Quasars, peculiar galaxies, pulsars, black holes, antimatter, etc. Prerequisite: Phys 10 or 12.

PHYSICS

First Group

1 Foundations of Physics (4) Parke

Lecture (2 hours), recitation (1 hour), laboratory (2½ hours). Development of conceptual principles underlying modern physical knowledge: basics of mechanics, heat, and light, including the classical concepts of energy, momentum, heat, temperature, entropy, and optics. Prerequisite: two years of college preparatory mathematics or concurrent registration in Math 6. Laboratory fee, $18.

2 Introduction to Modern Physics (4) Zuchelli

Lecture (2 hours), recitation (1 hour), laboratory (2½ hours). Topics focusing upon present understanding of the physical universe and character of the atomic and subatomic worlds, including considerations of electric and magnetic phenomena, relativity theory, wave-particle duality, quantum theory, nuclei, and subnuclear particles. Prerequisite: Phys 1 or equivalent. Laboratory fee, $18.

3 Foundations of Physics (3) Parke

Same as Phys 1 without laboratory.

***4 Introduction to Modern Physics** (3) Zuchelli

Same as Phys 2 without laboratory.

6 Energy and the Environment (3) Lehman

Consideration of energy resources and their utilization, impact on the environment from a physical viewpoint. Topics include: the demand for energy, the cost of energy, nuclear fission-radiation hazard to humans, pollution due to energy sources, transportation of energy and waste, and energy converters. Prerequisite: high school algebra.

14 Introductory Mechanics and Thermal Physics (3) Khatcheressian

Lecture (2 hours), recitation and laboratory (2 hours). Physical principles of mechanics and thermal physics utilizing tools of calculus. Topics emphasized are vector calculus, equilibrium phenomena, kinematics, Newton's Laws, conservation of mass, momentum and energy, rotational motion, small vibrations, thermometry, macroscopic and microscopic properties of ideal gases, the laws of thermodynamics, thermal properties of solids and liquids. Prerequisite: Phys 3 or equivalent, Math 31. Laboratory fee, $18.

15 Elements of Electricity and Magnetism (3) Taragin

Lecture (2 hours), recitation and laboratory (2 hours). Introductory aspects of electromagnetic theory. Topics include: static electric fields, Coulomb's Law, Gauss' Law, electrical potential, capacitance and dielectrics, electric current and resistance, Ampere's Law, Faraday's Law, Maxwell's equations in integral form, electromagnetic waves. Prerequisite: Phys 3 or equivalent, Math 31. Laboratory fee, $18.

16 Introduction to Modern Physics (3) Lehman

Lecture (2 hours), recitation and laboratory (2 hours). Elementary approach to the basic principles of quantum theory. Topics include wave-particle duality, the hydrogen atom, Pauli's exclusion prin-

*course may not be taken by students who have completed or are enrolled in or plan enroll in Phys 2.

ciple, x-ray spectra, the atomic nucleus, radioactivity, nuclear reactions, statistical distribution laws, applications to molecular and solid state physics. Prerequisites: Phys 14, 15; Math 32. Laboratory fee, $13.

27–28 **Physics in Medicine** (3–3) Parke

Principles of physics applied to biological systems and to medical instrumentation, including ultrasonic techniques, hydrodynamics, biocompatible optics in medicine, applications of IR and UV radiation, medical transducers, particle radiation in medicine, models of the brain, molecular biophysics. Prerequisite: Phys 1 or equivalent.

Second Group

151 **Intermediate Laboratory** (3) Taragin

Experiments selected to introduce students to research techniques and use of specialized instruments. Laboratory fee, $11. (Fall and spring)

161 **Mechanics I** (3) Prats

Mechanics of mass points and rigid bodies. Newton's laws, conservation laws, Hamilton's equations, inertia tensor, small vibrations, and elements of Lagrange's and Hamilton's mechanics.

162 **Mechanics II** (3) Prats

Basic aspect of continua including elasticity and fluid dynamics, stress tensor, strain tensor, equations of equilibrium, elastic waves, ideal and viscous fluids.

163 **Physical and Quantum Optics** (3) Eisenstein, Hobbs

Oscillations and waves, energy and momentum of the electromagnetic field, interference, coherence, geometrical optics, optics of crystals and other topics. Discussion.

164 **Thermodynamics** (3) Taragin

Principles and applications of equilibrium thermodynamics, reversible processes, thermodynamic potentials, stability and phase changes.

165–66 **Electromagnetic Theory** (3–3) Lehman, Eisenstein

Development of Maxwell's field equations using vector and tensor calculus, electrostatics, stationary and nonstationary currents, basic circuit theory, electromagnetic waves and radiation.

167 **Principles of Quantum Physics** (3) Khatcheressian

Development of logical structure and experimental bases for modern quantum mechanics. Simple examples worked out to clarify the structure; primary emphasis on conceptual framework and its mathematical realization: careful consideration of the postulates according to which the theory is constructed.

168 **Applied Quantum Physics** (3) Parke, Zuchelli

Explicit applications of principles of quantum mechanics to a variety of problems in atomic, molecular and nuclear physics. Quantum statistical mechanics developed with applications in solid state. Emphasis on explicit evaluation of solutions and the techniques required. Prerequisite: Phys 167 or equivalent.

170 **Elementary Solid State Physics** (3) Khatcheressian

Structure of solids, lattices and lattice defects, deformation, vibra-

thermal and electronic contribution to specific heats, binding energies, ferromagnetism in metals and semiconductors, magnetic properties of solids. Elementary methods required such as quantum mechanics and thermal ratio expectations are developed as needed.

175 Nuclear Physics (3) Lehman, Prats

Introduction to application of quantum physics in the description of nuclei and their interactions. Properties of nuclei, nuclear models, nuclear forces, and nuclear reactions are considered. Specific topics include the deuteron, n-p scattering, the optical model, the shell model, the liquid drop model, beta decay, fission, and fusion. Prerequisite: Physics 197 or permission of instructor.

195 Undergraduate Research (3) Staff

Research on problems approved by the staff. Admission by permission of the staff member concerned. May be repeated once for credit.

Third Group

Consent of a departmental graduate advisor is required for admission to all third-group courses in physics.

231 Electromagnetic Theory: Macroscopic Effects (3) Eisenstein

Detailed consideration of classical electromagnetic field theory in vacuum and in electrically and magnetically active media. Boundary-value problems, multipole expansions, retarded potentials, time-dependent fields, mass dependence of the fields, gauge transformations, radiation fields.

232 Advanced Mechanics (3) Zuchelli

Analytic methods of mechanics as a basis for modern theory. Variational principles, Lagrange equations, Hamiltonian formulation, canonical transformations, classical perturbation theory.

233–34 Quantum Mechanics (3–3) Prats

General aspects of quantum mechanics with emphasis upon the developmental principles involved. Operators, representations and transformation theory. Schrödinger and Heisenberg pictures, angular momentum, perturbation theory, scattering theory. (Academic year)

235 Special Relativity (3) Bergmann

Application of relativistic concepts to the basic fields of physics. Space and time, tensors and covariant mechanics of point particles, covariant form of electromagnetism, relativistic variational principles, relativistic quantum equations.

236 Electromagnetic Theory: Electrodynamics and Radiative Effects (3) Bergmann, Eisenstein

Analysis of problems involved in obtaining the motion of charges in given electromagnetic fields and radiation from such charges. Covariant methods developed and used where sensible. Specific topics include radiation by moving charges, spectral decomposition and integrated flux, angular distribution of radiation, radiation reaction and anomalies.

241 Statistical Mechanics (3) Lehman, Bergmann

Study of classical and quantum equilibrium statistical mechanics. Kinetic theory and transport phenomena reviewed prior to examining

principles of statistical mechanics. Among topics considered: distribution functions, H-theorems, partition functions, Gibb's paradox, canonical ensemble, grand canonical ensemble, ideal gases, interacting gases, cluster expansion, virial expansion, and density matrices.

242 **Atomic and Molecular Structure** (3) Bergmann

Structure of atoms and molecules, energy levels, binding energy, optical activity. Hartree and Hartree-Fock equations, spin-effects, rotational and vibrational effects, paramagnetic resonance, chemical binding.

243 **Solid State Physics: Structure and Binding** (3) Khatcheressian, Hobbs, Taragin

Atomic structure of solids and analysis of the binding of crystals. Crystalline forces and symmetries, atomic vibrations and specific heats, sound and optical propagation, crystalline defects.

244 **Solid State Physics: Electronic Processes in Metals** (3) Khatcheressian, Eisenstein

Phenomena in metals and semi-conductors determined by the electronic states allowed: binding, specific heats, magnetic properties, transport phenomena. Independent particle approximation and many-body aspects are discussed.

245 **Quantum Electrodynamics: Theory and Applications** (3) Zuchelli

A presentation of the lower order effects depending upon the quantal nature of the electromagnetic field. Hamiltonian formulation and field quantization, perturbation calculations. Compton effect, photoelectric effect, electron-electron scattering, pair creation and annihilation, indices of refraction, divergence difficulties.

246 **Quantum Field Theory** (3) Bergmann

Covariant presentation of general theory of quantized fields, Boson and Fermion fields, theory of S-matrix, dispersion relations, and renormalization program.

247 **Nuclear Theory** (3) Prats, Lehman

Nuclear interactions, nuclear models, theory of nuclear reactions, pion physics and weak interactions.

248 **Elementary Particles** (3) Parke

Experimental properties and present theoretical understanding of sub-nuclear particles; applied S-matrix formalism; symmetry principles; unified models, and theories of weak, electromagnetic, and strong interactions.

249 **Statistical Processes** (3) Zuchelli

Analysis of problems involved in understanding and predicting the approach to equilibrium of a complex system within the classical context, as exemplified by rare or dense gases, ionized gases or plasmas. Specific topics include Liouville equation, ergodic theory, Boltzmann equation, Boltzmann-Vlasov equation, Chapman-Enskog theory, Bogoliubov time scales, Prigogine type formalism, convergence questions.

250 **Selected Topics in Modern Physics** (3) Staff

Possible topics include nuclear three-body problem; group theory and symmetry principles in physics; differential manifolds applied to physics; electric states and superconductivity; gauge field theories

dispersion relations and unitarity in scattering theory. May be repeated for credit with permission of graduate adviser. [Fall and spring]

251–52 Laboratory (3–3) **Staff**

Individual work on special topics. Laboratory fee: $15 a semester. [Academic year]

254 General Theory of Relativity (3) Bergmann

Physical principles and mathematical methods underlying Einstein's field equations, geodesic equations of motion, checks of the theory, action principle, conservation laws, perturbation theory, gravitational radiation theory, relativistic cosmology. Offered on demand.

291 Seminar (1) Staff

Lectures on special problems in physics. May be repeated once for credit. (Fall and spring)

299–300 Thesis Research (3–3) Staff

(Fall and spring)

Fourth Group

398 Advanced Reading and Research (arr.) Staff

Limited to students preparing for the Doctor of Philosophy general examination. May be repeated once for credit. [Fall and spring]

399 Dissertation Research (arr.) Staff

Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

PHYSIOLOGY—GRADUATE PROGRAMS

Professors C.S. Tidball, R.A. Kenney *(Chairman)*, M.E. Tidball, M.M. Cassidy, M.J. Jackson

Associate Professors R.A. Lavine, D.W. Watkins

Master of Science in the field of physiology—Prerequisite: a bachelor's degree. No major is specified, but the undergraduate program must have included the following courses or their equivalents: BISc 11–12; Chem 11–12, 22, 151–52, 153–54; Math 31; Phys 1, 2.

Required: the general requirements, pages 88–96. In addition to the thesis, the 30 hours of required work should include Phyl 201, 221, 298, and at least three semester hours of research (Phyl 295).

Doctor of Philosophy in the field of physiology—Required: the general requirements, pages 88–91, 97–99. The program of study includes a major field in physiology, a subfield (see below) in physiology, and a minor field outside of physiology leading to the Cumulative Examination. The 48 semester hours of required course work leading to the Cumulative Examination should include Phyl 221–22 or Phyl 205, Phyl 201, 221, 298, 396, 397.

Research fields and areas of study: applied physiology, cardiovascular physiology, cellular physiology, endocrine physiology, gastrointestinal physiology, neurophysiology, renal physiology, and respiratory physiology.

Departmental prerequisite: Phyl 201 or equivalent is prerequisite to all courses in physiology numbered above 201.

Second Group

191 **Selected Topics in Human Structure and Function** (3) Kenney

Lecture 2 hours, laboratory (1 hour). Structural and functional bases of physiology. Though an undergraduate course, this is required for graduate students who have not had Anat 201 or equivalent; students may receive graduate credit on completion of additional work as prescribed by the instructor. Prerequisite: BiSc 11-12 or equivalent and consent of instructor. Open to Columbian College students with the approval of the major advisor. (Fall)

Third Group

201 **Physiology** (8) Staff

Lecture (8 hours), laboratory (2 hours), conference (1 hour). Cellular, organ system, and applied mammalian physiology. Prerequisite for graduate students: Anat 201 or Phyl 102, or equivalent; Bioc 201, 221-22 (Bioc 222 may be taken concurrently) or Phyl 205, or consent of chairman of department. Open to Consortium students only with permission of department chairman. (Spring)

205 **Cell Biophysics** (2) Jackson

Lecture (2 hours). An introductory survey of the mechanisms for interconversion and utilization of energy in animal cells. A required course for graduate students intending to take Phyl 201. Prerequisite: BiSc 11-12 or equivalent, and consent of instructor. Open to students in the Columbian College of Arts and Sciences with the approval of the student's major advisor. (Fall)

212 **Neurobiology** (3) Staff

Same as Anat 212. An integrated survey of the structure and function of the human nervous system; lecture, clinical demonstrations, and laboratory. Laboratory fee, $25.

221 **Seminar** (1) Cassidy

Staff and student presentations from literature. Present work discussed, experimental design and scientific deduction evaluated. Topics to be announced. Content differs each time the course is offered; may be repeated for credit. (Fall and spring)

*223-24 **Biomedical Instrumentation** (4-4) Staff

Same as Bioc 225-26 and Micr 240-41. Comprehensive study of theoretical and practical application of biomedical instrumentation to the separation, identification, and quantification of materials of interest to biomedical and forensic scientists. Laboratory fee, $50. (Academic year)

253 **Physiology of Fluid Balance and Hydrogen Ion Regulation** (2) Cassidy

Discussion on principles of fluid and acid-base balance and the application of these principles to scientific situations. (Fall)

260 **Membrane Physiology** (2) Jackson

(Formerly 1 credit)

Weekly lectures or seminar. Systematic review of the factors which determine the movements of water and solutes across simple cellular

* An interdisciplinary course offered by the Biochemistry, Microbiology and Physiology Departments.

membranes and complex epithelial barriers in animal tissues. Prerequisite: Phyl 205 or permission of instructor. (Fall)

261 **Gastrointestinal Physiology** (1 or 2) Jackson, Dobbins*

Weekly seminar on basic sciences in gastroenterology; intra- and extramural speakers. An approved paper required for two semester hours of credit. May be repeated for credit. (Fall and Spring)

262 **Topics in Cardiovascular Physiology** (2) Kenney

Survey at an advanced level of aspects of cardiovascular physiology essentially as interrelated with the respiratory and renal systems. (Fall)

†268 **Muscle Contraction: Physiological and Biochemical Aspects** (2) Walker, Frank

Anatomical, histochemical, pharmacological, and physiological aspects of muscle contraction. Prerequisite: an introductory course in biochemistry and physiology, or permission of the department.

269 **Topics in Neurophysiology and Psychophysiology** (2) Lavine

Selected topics in contemporary neurophysiology, including methods of data collection and analysis, control mechanisms involved in movement and behavior and sensory processing. Open to students in the School of Engineering and Applied Science with permission of instructor. (Fall)

270 **Computer Utilization in Physiology and Medicine** (3) C. Tidball

Lectures one hour a week; practical experience at student's convenience. Orientation to processing analog and digital signals on mini-computers. Programming in assembly language as well as a high-level language of the student's choice. No previous computer experience necessary. (Fall)

271 **Computer Simulation of Physiological Processes** (3) C. Tidball

Lectures 1 hour a week; practical experience at student's convenience. Programming of physiological simulations will be learned by writing a series of simulations of increasing complexity. Prerequisite: Phyl 270 or equivalent or permission of instructor.

272 **Reading and Research in Simulation of Physiological Processes** (3) C. Tidball

Readings in physiological simulations and their evaluation. Informal discussions of regular intervals. Prerequisite: Phyl 271 or equivalent or permission of instructor. May be repeated once for credit.

295 **Research** (arr.) Staff

By special arrangement with individual staff members. Approximately four clock hours in the laboratory for each semester hour of credit. Content differs each time course is offered; may be repeated for credit. (Fall and Spring)

298 **Comprehensive Physiology** (arr.) Staff

Guided review of selected areas of physiology appropriate to the student's graduate program. Prerequisite or concurrent registration: Phyl 221. (Fall)

* Dr. W. O. Dobbins III is Professor of Medicine, G.W.U. School of Medicine and Health Sciences.

† An interdisciplinary course offered by the Biochemistry and Physiology Departments.

299–300 **Thesis Research** (3–3) **Staff**
(Fall and spring)

Fourth Group

396 **Advanced Reading and Research** (2) **Staff**
Limited to students preparing for the Doctor of Philosophy general examination. Tutorial literature survey of a subfield of Physiology and of pertinent areas of the candidate's minor field. This course satisfies the requirement for Part II of the Cumulative General Examination in Physiology. (Fall and spring)

397 **Development of Dissertation Problem** (2) **Staff**
Limited to students preparing for the Doctor of Philosophy general examination. Preparation for written and oral presentation of dissertation problems. This course satisfies the requirement for Part III of the Cumulative General Examination in Physiology. (Fall and spring)

399 **Dissertation Research** (arr.) **Staff**
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

POLISH

See **Slavic Languages and Literatures.**

POLITICAL SCIENCE

Professors R.E. Purcell, H.L. LeBlanc, B. Nimer, A. Gyorgy, H.C. Hinton, B.M. Sapin, J.A. Morgan, Jr., B. Reich *(Chairman)*, Y.C. Kim
Adjunct Professor W.H. Lewis
Associate Professors C.F. Elliott, C.A. Linden, S.J. Wayne, J.M. Logsdon, H.R. Nau, R.L. Cole
Assistant Professors D. Fischer, S. Shaffer, C. McClintock, M.J. Sodaro *(Visiting)*, S.L. Wolchik *(Visiting)*, J.R. Henig, D.E. Pollock *(Visiting)*
Instructors E.A. Peterson, S.J. Carroll
Adjunct Instructor C.J. Deering
Lecturer W. Moskop

Bachelor of Arts with a major in political science (departmental)—The following requirements must be fulfilled:

1. The general requirements as stated on pages 72–73, 79–85.

2. Prerequisite: PSc 1 and 2. Six courses in the social sciences, other than political science, to include six hours of history or six hours of economics. Twelve semester hours of introductory foreign language and statistics are strongly recommended.

3. Required courses in the major: 30 semester hours of second-group political science courses, including a distribution requirement which consists of six semester hours from each of the following groups: Group A (political theory and methodology)—PSc 101, 102, 104, 105, 106, 107, 108, 109, 110. Group B (American government and politics)—PSc 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 122, 124. Group C (comparative government and politics)—PSc 130, 131, 146, 165, 168, 170, 173, 177, 179, 180, 181, 183. Group D (international politics, law, and organizations)—PSc 140, 142, 144, 149, 178, 182, 184.

Of the courses in Group A at least one must be PSc 101, 102, or 104, and it is recommended that this course be taken as early in the student's academic program as possible.

Every major must complete at least one pro-seminar (PSc 191 or 192) or, if eligible, an Honors Seminar (PSc 196, 197, 198, or 199) in the junior or senior year. A maximum of two of these may be included in a student's program. Such courses do not satisfy the department's group distribution requirements. A 200-level course may be substituted for the proseminar requirement with the permission of the instructor and the undergraduate coordinator. Completion of, or concurrent enrollment in, a methodology course (PSc 101, 102, or 104) is a prerequisite to the proseminars or 200-level courses.

Up to 12 hours of either service-learning or internship credit may be applied towards a degree. No more than six hours of such courses may be credited toward the major; these courses do not satisfy the distribution requirement.

Students in the 90 semester-hour degree program (see pages 81–82) must receive grades of *A* in at least 18 semester hours of second-group political science courses.

Students may apply for graduation with Special Honors. To qualify, the student must fulfill the general requirements (see page 50) and take at least one political science honors seminar in which an independent study project is completed with distinction. To be eligible for enrollment in an honors seminar, students must be political science majors, have successfully completed PSc 101, and have achieved a QPI in the major of at least 3.5 as juniors or at least 3.3 as seniors. PSc 101 may not be taken concurrently with the honors seminar.

Master of Arts in the field of political science—Prerequisite: a bachelor's degree with a major in political science from an accredited college or university, or an equivalent degree, and high undergraduate scholastic standing.

Required. The general requirements, pages 88–96, and either a reading knowledge of a modern foreign language or a specified level of knowledge in statistics, or two graduate-level courses in a cognate discipline. Students may elect one of the following programs: (1) 24 semester hours of graduate course work, plus a thesis (equivalent to six semester hours), and the satisfactory completion of a Master's Comprehensive Examination in three subfields selected from those listed under the Ph.D. program; or (2) 33 semester hours of graduate course work without a thesis and the satisfactory completion of a Master's Comprehensive Examination in four subfields selected from those listed under the Ph.D. program.

PSc 200 is required of all students during the first semester of graduate study, unless they demonstrate knowledge of the course's subject matter by passing a waiver examination.

Doctor of Philosophy in the field of political science—Students of outstanding ability are admitted to the doctoral program upon recommendation of a departmental graduate committee and the concurrence of the dean of the Graduate School of Arts and Sciences.

Required. The general requirements, pages 88–91, 97–99. Each student must complete a General Examination, which covers a major and minor field of study. PSc 200 and 201 are required of all students unless they demonstrate knowledge of the courses' subject matter by passing a waiver examination.

Each student must choose a major and minor field of study from four principal subject-matter divisions. Each subject-matter division has several subfields of study from which the student, in consultation with an advisor, constructs a program. A major field of study consists of three subfields; a minor field of study consists of two subfields.

The subject-matter divisions and their subfields are (1) theory and methodology (analysis of Western political thought, analysis of Marxist and Marxist-Leninist thought, and scope and methods of political science); (2) comparative

and foreign politics (comparative political analysis, systems, comparative public law and theories, politics of a specified major political system); (2) international relations (international politics, international law, international organization, regional international relations and foreign relations of a specified major political system); and (3) American politics (American political process, political parties, voting, public opinion, American constitutional law and civil liberties, executive, legislative, and judicial processes, and state, local, and urban politics). Quantitative political analysis may be used as a subfield in any of the subject-matter divisions.

Departmental prerequisite: PSc 1 and 2 (or their equivalent) are prerequisite to all second-group courses in political science.

First Group

1 **Introduction to Comparative and International Politics** (3) Gyorgy, Nau, McClintock, Sodaro

Comparative and international political systems, emphasis on structures and processes of major foreign governments and the forces of basic ideologies. (Fall and spring)

2 **Introduction to American Politics and Government** (3) Purcell, LeBlanc, Wayne, Cole

Structure, powers, and processes of the American political system. (Fall and spring)

3 **Introduction to Political Behavior** (3) Moskop

Study of political behavior, including the role of politics in today's world, the sources of elite and mass political behavior, and the influence and nature of political institutions. May be taken only with joint registration in Hum 3. (Fall)

*91 **East Asia—Past and Present** (3) Johnson and Associated Faculty

An interdisciplinary course, introducing the student to a comprehensive and integrated understanding of the civilization and present problems of East Asia.

Second Group

101 **Scope and Methods of Political Science** (3) Kim, Cole, Shaffer, Carroll

Nature of political inquiry, approaches to the study of politics and government, empirical methods of research. (Fall and spring)

102 **Empirical Political Analysis** (3) Cole, Shaffer

Introduction to the logic of empirical research methods in the analysis of political behavior. Research design, data collection (survey and aggregate), and data analysis. Prerequisite: PSc 101 or permission of instructor. (Spring)

104 **Methods of Public Policy Analysis** (3) Henig, Carroll

Models and case studies of public policy formation and change, techniques of policy analysis and evaluation, normative implications of alternative policy-making frameworks. (Spring)

* An interdepartmental course offered by the Political Science, East Asian Languages and Literatures, Economics, Geography and Regional Science, History, Philosophy, and Religion Departments

105 **Political Theory: Major Issues of Western Political Thought I** (3) Linden, Fischer
Foundations of Western political thought—Plato to Aquinas. (Fall and spring)

106 **Political Theory: Major Issues of Western Political Thought II** (3) Linden, Fischer
Theoretical roots of modern political order and disorder—Machiavelli to Rousseau. (Fall and spring)

107 **Issues in Modern Political Thought** (3) Linden, Wolchik
Issues of modern political thought as seen through major representative thinkers. Emphasis on conservative, liberal, and radical thought. (Fall)

108 **Modern Communist Ideologies** (3) Elliott
Intensive study of theories and philosophical assumptions of modern communism. Emphasis on the careers and ideas of leading figures: Marx, Engels, Lenin, Stalin, Khrushchev, and Mao. (Spring)

109 **Democratic Theory** (3) **Staff**
Issues of recent democratic thought and theory, particularly in relation to the contemporary American political process. (Fall)

110 **American Political Thought** (3) Morgan
Political thought in the U.S. from colonial times to the present as seen through major representative writings. (Spring)

111 **State and Urban Politics** (3) Cole, Henig
Comparative analysis of context, institutions, processes, and policies of state and urban political systems. (Fall)

112 **State and Urban Policy Problems** (3) Cole, Henig
Selected issues in state and urban policy-making with emphasis on urban and metropolitan settings. (Spring)

113 **Policy and Politics of Intergovernmental Relations** (3) Cole
Analysis of relationships among national, state, and local governments. Emphasis on the policy consequences of intergovernmental relations and the emerging federal system. (Fall)

114 **U.S. Constitutional Law and Politics I** (3) Morgan
Separation of powers, federal-state relationships, economic regulation. (Fall)

115 **U.S. Constitutional Law and Politics II** (3) Morgan
Political and civil rights. (Spring)

116 **The American Presidency** (3) Wayne
Examination of the politics of presidential selection, the authority of the contemporary institution, the mechanisms and processes for formulating public policy, and the influences of personality on performance. (Fall and spring)

117 **Public Administration and Bureaucratic Politics** (3) Teich
Basic concepts in public administration; influence of bureaucratic politics on policy formulation and implementation. (Spring)

118 Legislative Process (3) — Deering

Study of Congress, including theories of representation, legislative power structure, selection of legislators and the roles they play, decision-making, and the relationship between the legislative and executive branches. (Fall and spring)

119 U. S. Political Parties and Politics (3) — LeBlanc

Role of parties as a linkage between mass preferences and government policies. Organization, nominations, voting and activities in legislative and executive branches. (Fall and spring)

120 Public Opinion and Political Socialization (3) — Carroll

Sources of mass political attitudes and behavior; voting and political campaigning. (Fall)

122 Science, Technology and Politics (3) — Logsdon, Teich

Multiple impacts of scientific and technological developments on the political systems. Discussion of public policies for support, use, and control of science and technology. (Fall and spring)

124 Issues in Domestic Public Policy (3) — Cole, Henig

Current status of governmental programs dealing with various social problems in such areas as health, crime, poverty, education, and transportation. (Fall or spring)

130 Comparative Government and Politics I (3) — Kim, McClintock, Peterson

Comparative political analysis with primary focus on the principal states of Western Europe. (Fall and spring)

131 Comparative Government and Politics II (3) — Gyorgy, Hinton, Elliott, Sodaro, Wolchik

Government and politics of the communist nations; emphasis on the Soviet Union and countries of Eastern Europe. (Fall and spring)

140 International Politics (3) — Nau, Shaffer

International actors, international and domestic environments of foreign policy, global and regional patterns, general characteristics of foreign policy. (Fall and spring)

142 International Organizations (3) — Nau, Stambuk

Development and operations of the United Nations, regional organizations, and functional international organizations. (Fall and spring)

144 Public International Law (3) — Fischer

Survey of international law, emphasis on development and trends. (Fall and spring)

146 U. S. Foreign Policy (3) — Purcell

Constitutional, political, and international factors that determine the formulation, execution, and substance of U.S. foreign policy. (Fall and spring)

149 Military Force and Foreign Policy (3) — Sapin, Lewis

Impact of military considerations on U.S. foreign policy; major problems in national security, e.g., strategic weaponry, military assistance, regional security problems. (Fall)

161 **European-Atlantic Relations** (3) Stambuk
International politics of the North Atlantic area, the European Common Market, and U.S.-European relations. (Fall)

165 **Government and Politics in Eastern Europe** (3) Gyorgy
Study of the contemporary social and ethnic structures, governmental systems, and international position of the Eastern European states within the Soviet system. (Summer)

168 **Soviet Foreign Policy** (3) Elliott
Relations with U.S., Europe, Third World, China; international communism; instruments of foreign policy; interrelationships between domestic and foreign policies; ideology and foreign policy. (Fall)

170 **Governments and Politics of China and Japan** (3) Hinton
Political institutions and processes of China since 1949 and of Japan since 1945. Influence of indigenous traditions and foreign contacts. (Fall)

173 **Governments and Politics of South and Southeast Asia** (3) Hinton
Domestic and international politics of the area's major states. (Spring)

177 **Governments and Politics of the Middle East** (3) Reich, Pollock
Politics of the eastern Arab states, Turkey, Iran, Israel. (Fall)

178 **International Relations of the Middle East** (3) Reich, Pollock
Analysis of the regional and international relations of the Middle East. (Spring)

179 **Israeli Foreign Policy** (3) Reich
Examination of the institutions, processes and issues of Israeli foreign policy. (Fall)

180 **Governments and Politics of North Africa** (3) Reich, Lewis
Domestic and international politics of Algeria, Tunisia, Morocco, Libya, Egypt, Sudan; their relations with states of the Middle East. (Spring)

181 **Politics of Middle and Southern Africa** (3) Nimer
Comparative analysis of political systems in selected countries of non-Mediterranean Africa. (Fall)

182 **African International Politics** (3) Nimer
Analysis of interstate relations in Africa and of selected aspects of African relations with the outside world. Recommended prerequisite: PSc 181 or equivalent. (Spring)

183 **Governments and Politics of Latin America** (3) McClintock
Political processes and institutions in Latin America; emphasis on Argentina, Brazil, Chile, and Mexico. (Fall)

184 **International Relations of Latin America** (3) McClintock
U.S.-Latin American relations, inter-American diplomacy and organization, foreign policies of selected states, the Cuban revolution. (Spring)

*187 **Internship: Political Behavior** (3 or 6) Deering
Internship with a variety of interest groups and, during election years, political campaigns. Analysis of the structural and behavioral limitations which confront those who wish to exercise political influence. May be repeated for credit with a different work experience. **(Fall and spring)**

*188 **Internship: Urban Affairs** (3 or 6) Henig
Study of urban political and policy-making processes through assignment to an urban-related political or governmental office. Primarily for senior urban affairs majors. (Fall and spring)

*189 **Internship: Legal Process** (3 or 6) Wallace
The legal system and its role in promoting social change. Readings, group discussions, and work with lawyers and third-year law students. **(Fall and spring)**

*191 **Proseminar: International Affairs** (3 or 6) Sapin, Reich
Examination of selected problems in international relations. (Fall and spring)

*192 **Proseminar: Political Science** (3) Staff
Examination of selected problems in political science. (Fall and spring)

*193 **Proseminar: Urban Affairs** (3 or 6) Henig
Readings, research, and class discussion on selected topics in urban politics and policy-making. Primarily for senior urban affairs majors. **(Fall and spring)**

*196 **Honors Seminar: Political Theory** (3) Staff
Research on selected topics. Prerequisite: PSc 101. (Fall or spring)

*197 **Honors Seminar: American Government and Politics** (3) Staff
Research on selected topics. Prerequisite: PSc 101. (Fall or spring)

*198 **Honors Seminar: Comparative Government and Politics** (3) Staff
Research on selected topics. Prerequisite: PSc 101. (Fall or spring)

*199 **Honors Seminar: International Politics** (3) Staff
Research on selected topics. Prerequisite: PSc 101 (Fall or spring)

Third Group

200 **Scope and Methods of Political Science** (3) Linden, Shaffer, Carroll
Introduction to the discipline and profession, analysis and comparison of some approaches to political inquiry, and empirical research design. **(Fall and spring)**

201 **Empirical Political Analysis** (3) Cole, Shaffer, Carroll
Techniques of social science data analysis. Emphasis on using computers for statistical analysis in political research. No previous experience with statistics or computers required. (Fall)

202 **Advanced Topics in Empirical Political Analysis** (3) Cole, Shaffer
Advanced techniques of data collection and analysis; varying emphasis on such methods as causal modeling, analysis of variance, regression analysis, and simulation. **(Spring)**

* Admission requires departmental approval.

202 **Public Policy Analysis** [illegible] Teich, Henig, Carroll
Reading and research on systematic methods of public policy analysis. (Spring)

205 **Readings in Political Theory** (3) Linden
Selected major works, both ancient and modern, which illuminate [illegible] problems and questions of political theory. (Fall)

206 **Topics in Political Theory** (3) Linden, Fischer
Advanced readings and group discussions. Analysis and interpretation of selected concepts and schools of thought. (Spring)

207 **Readings in Socialism and Communism** (3) Elliott, Linden, Wolchik
Readings and discussions of works illustrating the development of pre- and post-Marxian socialist thought. (Fall)

208 **Readings in Marxism-Leninism** (3) Elliott, Linden
Readings and discussions in Marxism-Leninism and its controversies from Lenin to the present. (Spring)

209 **Democratic Theory** (3) Staff
Readings and discussions in democratic theory. Attention to recent work toward formulation of adequate theory in American political science. (Fall or spring)

210 **American Political Thought** (3) Staff
Readings and discussions. Analysis and evaluation of major intellectual sources of American political thought.

211 **State Politics** (3) Cole, Henig
Comparative analysis of American state politics, including state political institutions and policy-making processes, state policy choices, and the state role in the federal system. (Fall)

212 **Urban Politics** (3) Cole, Henig
The socioeconomic, demographic, and cultural context of urban politics; informal patterns of power and influence in urban decision-making; formal institutions and policy-making processes; urban policies and their impacts. (Spring)

213 **Intergovernmental Relations** (3) Cole
Analysis of the fiscal, territorial, social and political aspects of the evolving federal system; emphasis on metropolitan government. (Fall)

214 **Topics in Constitutional Law** (3) Morgan
Lectures and group discussions on constitutional law and politics. (Fall, even years)

215 **Judicial Policy-making** (3) Morgan
Role of the judiciary in policy formulation; emphasis on the U.S. Supreme Court and civil liberties issues. (Fall, odd years)

218 **American Presidency** (3) Wayne
Personalized and institutionalized aspects of the presidency with particular emphasis on the politics of legislative policy-making. (Fall)

217 **Bureaucratic Politics** (3) Teich
Structure and operation of governmental bureaucracy with particu-

lar emphasis on the politics of formulating and implementing public policy. (Spring)

218 **Legislative Theory and Behavior** (3) Deering
Organization, behavior, and policy outputs of the U.S. Congress. (Spring)

219 **American Political Parties and Electoral Behavior** (3) LeBlanc
Nature and functions of political parties, with special emphasis on party influences on electoral behavior and congressional decision-making. (Fall)

220 **Public Opinion and Political Socialization** (3) Carroll
Sources and dynamics of public opinion and political socialization. (Spring)

222 **Government, Science, and Technology** (3) Logsdon, Teich
National and international policy issues which arise from the interaction between scientific and technological development and governmental activity. (Fall)

223 **Science, Technology, and Public Affairs** (3) Logsdon, Teich
Selected public policy issues with significant scientific or technological aspects. (Spring)

230 **Comparative Government and Politics I** (3) Kim, McClintock, Peterson
Examination of basic approaches to comparative politics. (Fall)

231 **Comparative Government and Politics II** (3) Kim, McClintock, Peterson
Comprehensive examination of specific issue areas in comparative political analysis. (Spring)

*232 **Comparative Communist Systems I** (3) Wolchik
Ideological foundations of communism; emergence of the Soviet system; development of the international communist movement to World War II; postwar formation of the Soviet bloc. (Fall)

*233 **Comparative Communist Systems II** (3) Wolchik
Comparative analysis of recent ideological trends, political institutions, and behavior among ruling and nonruling Communist Parties. (Spring)

240 **Theories of International Politics I** (3) Nimer, Shaffer
Critical examination of contemporary theories, both empirical and normative, with emphasis on actor theory. (Fall)

241 **Theories of International Politics II** (3) Nimer, Shaffer
Critical examination of contemporary theories, both empirical and normative, with emphasis on interaction theory. (Spring)

242 **Problems in International Organizations I** (3) Nau, Stambuk
Social and economic interdependence and the politics of international organizations. (Fall)

243 **Problems in International Organizations II** (3) Nau, Stambuk
Collective security, law, and the politics of international organizations. (Spring)

* An interdepartmental course offered by the History and Political Science Departments.

244 **International Law I** (3) — Fischer

Readings in selected areas. (Fall)

245 **International Law II** (3) — Fischer

Research in selected areas. (Spring)

246 **U. S. Foreign Policy** (3) — Purcell

Research and selected reading as the basis for analysis of U.S. foreign policy. Particular reference to the decision-making process and policy execution. (Fall)

247 **Public Opinion and Foreign Policy** (3) — Purcell

Research and readings on U.S. public opinion interest groups that influence foreign policy. (Spring)

248 **U. S. National Security Policy-making** (3) — Sapin, Lewis

Executive organization and processes for national security policy-making. Attention to relevant theoretical approaches. (Fall)

249 **U. S. National Security Policy** (3) — Sapin

Fundamental considerations, selected issues, e.g., arms control and disarmament, regional security problems, military assistance. (Spring)

252 **Science, Technology, and World Order** (3) — Nau

Intensive reading, discussion, and research on the impact of science and technology on world order, in particular on the claim that a new global politics is replacing traditional or nation-state politics. (Spring)

260 **Western European Politics** (3) — Peterson

Comparative examination of major characteristics of the political systems in France, England, and the two Germanies. Special attention to political culture, socialization, recruitment, and communication. (Fall and spring)

261 **Problems in Transnational and Comparative Politics of Western Europe** (3) — Stambuk, Peterson

National and supranational political processes in Western Europe; emphasis on interest aggregation and articulation interbureaucratic relations, and selected policy outcomes in the context of the European Common Market.

263 **Communism in Non-Communist Europe** (3) — Sodaro

Examination of non-ruling European communist parties; relations between these parties and other ruling and non-ruling communist parties.

264 **The International Politics of Eastern Europe** (3) — Gyorgy and Staff

Major historical, political, social, and regional factors which have shaped the inter-war, World War II, and post-war evolution of Eastern Europe; emphasis on foreign relations with outside powers and on regional East-West contacts. (Spring)

265 **Governments and Politics of Eastern Europe** (3) — Gyorgy and Staff

A comparative study of Eastern European states: political, social, economic institutions; emphasis on domestic conditions and problems of individual Eastern European countries. (Fall)

266 **Readings in Soviet Government and Politics** (3) **Elliott, Linden**
Readings in contemporary Soviet domestic government and politics. (Fall)

267 **Soviet Government and Politics** (3) **Elliott, Linden, Wolchik**
Research seminar in selected problems in Soviet domestic government and politics. Graduate Study Prerequisite: PSc 266 or permission of instructor. (Spring)

268 **Soviet Foreign Policy** (3) **Elliott**
External problems and policies of the Soviet Union, with emphasis on the period since 1945: relations with other communist states, Western powers, other countries and non-ruling communist parties. (Spring)

269 **Soviet Military Policy and Strategy** (3) **Wolfe, Elliott**
Soviet developments in military policy and strategy, with attention to intra-bloc military cooperation, political context of Soviet military policy, and the significant changes in recent Soviet military thought. (Fall or spring)

270 **Politics of Mainland China I** (3) **Hinton**
Introduction to the literature and to graduate research in contemporary Chinese politics. Readings and group discussion. (Fall)

271 **Politics of Mainland China II** (3) **Hinton**
Introduction to the literature and to graduate research in contemporary Chinese politics. Research seminar. (Spring)

272 **Foreign Policy of Mainland China** (3) **Hinton**
Objectives, formulation and implementation. Communist China as Asian state, revolutionary influence, would-be great power. (Spring)

273 **Governments and Politics of South and Southeast Asia** (3) **Purcell**
Research and assigned readings as basis for analysis of structure, problems, and policies of the governments of selected countries, particular reference to India. (Spring)

274 **Southeast Asia in World Politics** (3) **Staff**
Southeast Asia in great-power perspective. Balance-of-power concept and development of Asian subsystem. (Spring)

275 **International Politics of the Far East** (3) **Hinton**
Foreign policies and international behavior of regional states and extraregional powers, principally the U.S. and the Soviet Union. (Fall)

276 **Governments and Politics of Japan and Korea** (3) **Kim**
Readings and research on the domestic and foreign policies of Japan, North and South Korea. (Fall or spring)

277 **Governments and Politics of the Middle East** (3) **Reich, Pollock**
Readings and research on selected problems of the governments and politics of the Middle East. (Fall)

278 **International Relations of the Middle East** (3) **Reich, Pollock**
Readings and research on the regional and international relations of the Middle East. (Spring)

280 **Governments and Politics of North Africa** (3) Reich, Lewis
Readings and research on selected problems in the governments, politics, and international relations of North Africa. (Spring)

281 **Topics in African Politics** (3) Nimer
Readings, research, and discussion of selected aspects of African domestic and international politics. (Spring)

283 **Latin American Politics I** (3) McClintock
Readings and discussions on Latin American political processes and institutions. (Fall)

284 **Latin American Politics II** (3) McClintock
Individual research and class discussion on selected topics. (Spring)

285 **Problems in Latin American Civilization** (3) Staff
Interdisciplinary seminar, partially guided by a specialist in the methodology of his/her chosen discipline; each student writes a report on some aspect of a selected key theme. Admission by permission of instructor. (Spring)

286 **Selected Topics in American Politics** (3) Staff
Readings and discussion. (Fall or spring)

287 **Selected Topics in Political Theory** (3) Staff
Readings and discussion. (Fall or spring)

288 **Selected Topics in Comparative Politics** (3) Staff
Readings and discussion. (Fall or spring)

289 **Selected Topics in International Politics** (3) Staff
Readings and discussion. (Fall or spring)

290 **Colloquium: Middle East** (3) Reich
Interuniversity colloquium for advanced students of Middle East affairs. Admission by permission of the instructor. (Fall and spring)

291 **Colloquium: East Asia** (3) Hinton
Interuniversity colloquium for advanced students of Far Eastern affairs. Admission by permission of the instructor. (Fall and spring)

292 **Colloquium: Russia and Eastern Europe** (3) Gyorgy
Interuniversity colloquium for advanced students of Russian and Eastern European affairs. Admission by permission of the instructor. (Fall and spring)

297 **Reading** (3) Staff
Limited to master's degree candidates. Written permission of instructor required. (Fall and spring)

298 **Research** (3) Staff
Limited to master's degree candidates. Written permission of instructor required. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff

Fourth Group

301 **Advanced Reading and Research in Political Theory** (3) Staff

310 **Advanced Reading and Research in American Politics** (3) Staff

340 **Advanced Reading and Research in Comparative Politics** (3) Staff

350 **Advanced Reading and Research in International Politics** (3) Staff

397 **Advanced Reading** (3) Staff

Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

398 **Advanced Research** (3) Staff

Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (3) Staff

Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

PORTUGUESE

See **Romance Languages and Literatures.**

PSYCHOLOGY

Professors T. Hunt *(Emeritus)*, E.L. Phillips, J.N. Mosél *(Chairman)*, B.I. Levy, W.E. Caldwell, R.D. Walk, R.K. White *(Emeritus)*, A.D. Kirsch, E. Johnson *(Emeritus)*, V. Kirkbride *(Emeritus)*, C.E. Rice, E. Abravanel, D.E. Silber, J. Miller, C.J. Lange

Adjunct Professors R.F. Caron, J.B. Margolin

Professorial Lecturers R.K. Kahn, S.L. Cohen

Associate Professors C.E. Tuthill, R.H. Tauck *(Research)*, S.A. Karp, R.W. Holmstrom, L.A. Rothblat

Adjunct Associate Professors D.G. Kleiman, F. Schmidt

Associate Professorial Lecturer E.C. Stewart

Assistant Professors P.J. Poppen, L. Brandt, S.K. Green, A.R. Bruhn, S. Hashtroudi

Clinical Training Staff

Professor J. Borriello

Associate Clinical Professors I.M. Zimmerman, J.W. Cummings, M.E. Zedek, E. Blum, P.D. Daen, D.A. Evans

Bachelor of Arts with a major in psychology (departmental)—The following requirements must be fulfilled:

1. The general requirements as stated on pages 72–73, 79–85.

2. Prerequisite courses—seven or eight semester hours selected from Psy. 1, 5 and 6.

3. **Required courses in related areas:**

(a) three semester hours selected from Stat 51, 53, or any first-group course in mathematics except Math 6. (Students expecting to do graduate study in psychology should elect Stat 53.)

(b) 12 semester hours selected from American civilization, anthropology, economics, geography and regional science, history, philosophy (Phil 71, 151 recommended), political science or sociology, of which six hours must be

from one of the following: anthropology, economics, history, political science or sociology. If a student takes more than six hours in any one department, the excess will be credited to electives.

4. Required courses in the major—24 semester hours in second-group psychology courses, including Psyc 196 and one course from each of the following groups—*Group A:* Psyc 118, 121, 161; *Group B:* Psyc 115, 144, 151, 156; *Group C:* Psyc 101, 112, 129, 131.

It is recommended that students contact their academic advisers as soon as possible for assistance in planning their programs of study.

Although there is no foreign language requirement, students contemplating graduate study are reminded that most graduate schools require knowledge of one and sometimes two foreign languages.

Master of Arts in the field of psychology—Prerequisite: the degree of Bachelor of Arts with a major in psychology at this University, or an equivalent degree. Admission to the program is limited; preference will be given those who plan to continue toward a Doctor of Philosophy degree.

Required: the general requirements, pages 88–90. Of the 24 required semester hours (exclusive of the thesis), a maximum of 12 must be in third-group psychology courses including Psyc 202 and either 203 or 204; six may be in related fields approved by the department. For detailed requirements consult the chairman of the department.

Doctor of Philosophy in the field of psychology—Prerequisite: the degree of Bachelor of Arts with a major in psychology. Students admitted from other disciplines will be expected to complete prerequisite undergraduate courses to prepare for graduate study in psychology. Qualifying scores on the Miller Analogies Test and the Aptitude Test of the Graduate Record Examination are required for admission.

Required: the general requirements, pages 88–91, 97–99, including (1) the satisfactory completion of the tool requirement (see page 97); (2) Psyc 202, 203–4, Stat 105, and (3) the satisfactory completion of a Preliminary Examination and later, a major Field Examination.

Areas of study: clinical, developmental, experimental, industrial and organizational, and social psychology.

Students electing psychology courses in the freshman year should begin with Psyc 1; with permission of instructor students may elect Psyc 5–6 in the freshman year.

Departmental prerequisite: Psyc 1 or 5 or 6 is prerequisite to all other courses in psychology. The departmental prerequisite may be waived with the permission of the instructor.

First Group

1 General Psychology (3) **Staff**

Fundamental principles underlying human behavior. (Fall and spring)

5–6 Principles and Methods of Psychology (4–4) Walk, Hashtroudi

Lecture (3 hours), laboratory (3 hours). An experimental approach to understanding behavior; individual and class experiments performed. Psyc 5: sensation, perception, and emotions and their relation to adaptive behavior. Psyc 6: memory, human information processing, learning, and motivation. Laboratory fee, $6 per semester. (Academic year)

8 **Psychology of Motivation and Personality** (3) Tuthill, Bruhn
Introduction to the psychology of personality. Principles of motivation, personality development, social and cultural factors, and assessment and description of personality emphasized. (Fall and spring)

22 **Introduction to Educational Psychology** (3) Kirkpatrick, Tanner
The contributions of psychology to education; emphasis on learning. (Fall and spring)

29 **Psychology of Childhood** (3) Brandt, Bruhn
Developmental approach to study of the child. Emphasis on the socialization process, learning, and the child's view of the world. (Fall and spring)

Second Group

101 **Abnormal Psychology** (3) Silber, Holmstrom, Bruhn
Causes, diagnosis, treatment, and theories of various types of maladjustments and mental disorders. (Fall and spring)

104 **Ecology and Mental Health** (3) Kaye
Investigation by field research of the linkages between aspects of the physical environment and mental health. Lectures and student field research projects. (Fall)

105 **The Psychology of Consumer Behavior and Attitudes** (3) Phillips
Consumer behavior and attitudes in regard to advertising, buying decisions, group and social pressures. Art and practice of opinion interviewing and field work. (Spring)

108 **Humanistic Psychology** (3) Mosel
Critical examination of humanistic psychology. Emphasis on role of consciousness in human behavior. Philosophic foundations existential and phenomenological psychology, the new mentalism. (Spring)

110 **Perception and Understanding in Children** (3) Abravanel
Critiques and research in the area of developmental psychology; emphasis on the growth and development of perception, cognition, and language. (Spring)

112 **Psychology of Adolescence** (3) Bruhn, Johnson
Psychological characteristics and problems peculiar to adolescence with emphasis on application of psychology to solution of such problems. (Fall and spring)

115 **Psychology of Language and Communication** (3) Mosel
Introduction to psycholinguistics and verbal behavior. Information theory, generative grammar, theory, cultural and linguistic structure in the perception and learning of language. (Fall and spring)

117 **Psychology of Art and Picture Perception** (3) Walk
Principles of perception as applied to art. Theories of Arnheim, Gibson, Gombrich, and Goodman as related to art and picture perception, study of cross-cultural research and research with children.

118 **Neuropsychology** (3) Rothblat
Analysis of neural processes underlying behavior. Basic structure and functions of the nervous system, with emphasis on sensory

processes, learning and memory, motivation, and emotion. (Fall and spring)

119 **Group Dynamics** (3) Miller
Relationship of the individual to groups, collectivities, and larger social systems. Theory, research, and applications of group and organizational processes, emphasizing contributions of Freud, Lewin, Bion, Mills, Slater, Mann, Miller and Rice. Enrollment limited. (Spring)

121 **Psychology of Learning** (3) Hashtroudi
Theories and issues related to basic learning processes as determinants of behavior. Emphasis on current research using both human and animal subjects. (Fall)

122 **Psychology and Human Relations** (3) Silber
Understanding basic relations and T-group techniques by forming an on-going T-group within the course itself. For junior and senior undergraduate social science majors; open to others with permission of instructor. (Summer)

124 **Aggression: Its Nature and Determinants** (3) Abravanel
Study of research with adults, children and animals; influence of mass media and cultural comparisons in handling and channeling aggression. Examination of contemporary theories of aggression.

129 **Theories of Personality** (3) Karp, Poppen
Survey of personality theories; emphasis on their application to problems of individuals. (Fall and spring)

130 **Seminar: Political and Social Implications of Current Approaches to Psychological Treatment** (3) Karp
Discussion and presentation of recent works, such as those of Szasz, Goffman, and Laing, critically evaluating current approaches to psychological treatment, including psychotherapy and behavior modification.

131 **Psychological Tests** (3) Hunt, Karp, Holmstrom
Survey of psychological tests and their most common uses in business, industry, government, law, medicine, and education. Material fee, $7. (Fall and spring)

132 **Socialization in Childhood** (3) Brandt
Examination of primary methods by which the child is shaped in terms of social judgment and self control; internalization of controls, assimilation of societal values and parenting procedures. Organized by focus on issues according to developmental level.

144 **Personnel and Industrial Psychology** (3) Cohen, Mosel
Psychological concepts and methods applied to problems of personnel management, human engineering, employee motivation and productivity. (Fall and spring)

150 **Psychology of Sex Differences** (3) Poppen
Research, statistical, psychological, and sociological influences on males and females in the development of sex differences; hormonal differences, gender identity, differential socialization of sons and daughters, masculinity/femininity, cultural evaluation of male and female roles. Survey of relevant psychological theory. Emphasis on empirical research and hypothesis testing.

151 **Social Psychology** (3) Tuthill, Poppen, Green

Social foundations of attitudes and behavior: cognition, motivation, role-behavior, communication, small-group processes, racial attitudes, nationalism and war. (Fall and spring)

154 **Psychology of Criminology** (3) Silber

Examination of many psychological aspects of criminal behavior; personality of criminals and of psychological processes affecting behavior. (Fall)

156 **Psychology of Attitudes and Public Opinion** (3) Tuthill

Psychology of opinion formation, measurement of opinion, social determinants of attitudes, psychological processes in propaganda, bases of receptivity to propaganda, psychological warfare. (Spring)

158 **Psychology of Interpersonal Attraction** (3) Green

Psychological bases for interpersonal attraction; emphasis on personal variables, relevant theoretical approaches and effects of attraction on other behavior.

161 **Comparative Psychology** (3) Caldwell

Lectures and demonstration on animal psychology. Psychological processes in infrahuman organisms, evolution of behavior, the place of animal experimentation and research in psychology. (Spring)

168 **Principles and Techniques in Neuropsychological Research** (3) Rothblat

Introduction to basic anatomical, physiological and behavioral techniques used in neuropsychological research to explore relationships between the brain and behavior. Admission by permission of instructor. Laboratory fee, $20. (Spring)

170 **Clinical Psychology** (3) Levy

An exploration of the history, functions, and problems of the clinical psychologist. Assessment, treatment, community approaches, ethics. Prerequisite: Psyc 101, 131. (Spring)

188 **Attitudes toward Death and Dying** (3) Staff

Exploration of the many different aspects, attitudes, and experiences associated with the process of death and dying. Limited to juniors and seniors.

191 **Independent Research in Psychology** (3) Staff

Opportunity for work on individual library or experimental projects. Open to qualified students by permission; arrangements must be made with the sponsoring faculty member prior to registration. May be repeated once for credit. (Fall and spring)

192 **Field Experience in Psychology** (3) Abravanel

Senior psychology majors will spend a minimum of six hours a week in a local mental health, rehabilitation, school, or community setting. Students registering for this course must have the approval of the instructor by May 15 for the fall semester and by December 15 for the spring semester. (Fall and spring)

196 **History and Systems of Psychology** (3) Caldwell, Rice

Senior capstone course which includes a survey and integration of the major viewpoints and concepts of psychology. Required of psychology majors. (Fall and spring)

197 **Honors Seminar in Psychology** (3) Staff

Selected topics in psychology which change from semester to semester. Intended primarily for juniors who plan to enroll in Psyc 191 (independent research) in the senior year. May be repeated for credit.

198 **Current Research Issues in Psychology** (3) Staff

Conducted as a seminar. Recent experiments in psychology, including those performed by members of the class; emphasis on student participation. May be repeated for credit.

Third Group

Third-group courses are limited to graduate students in psychology, except by special permission of instructor.

202 **Psychological Research Methods and Procedures** (3) Abravanel, Holmstrom

Required in all graduate psychology programs. Prerequisite: graduate standing, a laboratory course in psychology, and an elementary course in statistics. (Spring)

203–4 **Experimental Foundations of Psychology** (3–3) Hashtroudi, Rothblat and Staff

Required of doctoral students in psychology during first year of study. Psyc 203: basic issues in learning and motivation. Psyc 204: physiological processes; sensation and perception. (Academic year)

205 **Research Methods in Intervention Programs** (3) Karp

Special problems of conducting research in a clinical setting; emphasis on content and method of studies designed to assess effects of therapeutic intervention. Prerequisite: Psyc 202. (Fall)

206 **Methods of Clinical and Personality Research** (3) Rice

Review of techniques especially relevant to research in clinical, personality, and social psychology. Scaling methods, multivariate techniques, introduction to the use of computers in data analysis. Prerequisite: Psyc 202, Stat 105 or equivalent. (Spring)

207–8 **Psychological Assessment** (3–3) Holmstrom, Levy, Silber

Open only to clinical graduate students in the Department of Psychology. Theoretical and clinical aspects of assessment; includes interviewing, psychometric tests, and projective techniques. Two-hour laboratory; diagnostic work at clinical facilities. Material fee, $7 per semester. (Academic year)

209 **Seminar: Psychology of Motivation** (3) Caldwell

Various theoretical approaches to the psychology of motivation; systematic concepts and experimental findings deriving from each approach. (Spring)

211 **Assessment of Cognitive Functioning** (3) Levy

Concepts of intelligence and achievement and their assessment through a variety of individual procedures. Material fee, $7. Admission by permission of instructor. (Summer)

212 **Personality Assessment by Projective Techniques** (3) Levy

Methods of personality assessment, primarily the Rorschach. Material fee, $7. Admission by permission of instructor. (Summer)

213–14 **Seminar: Developmental Psychology** (3–3) Abravanel, Walk, Brandt

Psyc 213: research and theory in developmental psychology, emphasis on perceptual and cognitive development; consideration of the development of social awareness and of genetic-biological growth processes. Psyc 214 current research and theory in perceptual, cognitive, and social development; intensive study of selected research problems. [Academic year]

215 **Personality Assessment by Multiple Procedures** (3) Brandt, Bruhn

Consideration and use of a wide range of procedures in assessment of personality and psychopathology of children. Prerequisite: Psyc 207–8 or 211 and 212. Graduate students in fields other than psychology admitted by permission of instructor. Material fee, $7. [Summer]

216 **Psychological Assessment by Graphic Means** (3) Levy

Examination of graphic procedures for assessment of intelligence and personality; clinical use and evidence of validity. Common interpretive principles sought. Human figure drawings and free paintings as examples. Admission by permission of instructor. (Fall)

218 **Seminar: Systems of Psychotherapy** (3) Silber

Introduction to theory and technique of psychotherapeutic approaches: psychoanalytic, ego-centered, nondirective, transactional, and others. Original sources surveyed. [Summer]

219 **Group Dynamics** (3) Miller

Relationship of the individual to groups, collectivities, and larger social systems. Theory, research and applications of group and organizational processes, emphasizing contributions of Freud, Lewin, Bion, Mills, Slater, Mann, Miller and Rice. Enrollment limited. [Spring]

220 **Seminar: Abnormal Psychology** (3) Miller

Study of selected problems of psychopathology. [Fall]

221–22 **Seminar: Group Psychotherapy** (3–3) Borriello

For graduate students in the clinical psychology program. Open to others if space permits and with permission of instructor. Psyc 221: survey of group therapy approaches; Psyc 222: supervised experience with therapeutic groups. Prerequisite to Psyc 221: Psyc 219. [Academic year]

223 **Seminar: Learning** (3) Hashtroudi

Selected topics of current research interest in the psychology of learning. (Spring)

225 **Seminar: Child Psychotherapy** (3) Bruhn

Theory and practice of insight-oriented psychotherapy with children. Class observation of an ongoing treatment case. Supervised treatment of a child in a practicum setting. Permission of instructor required for all students except graduate students in the child clinical track. (Spring)

226 **Seminar: Clinical Psychology of Childhood and Adolescence** (3) Brandt

For graduate students in psychology, open to others with permission of instructor, if space permits. Exploration of major topics central

ing psychopathology in children and adolescents, discussion of nosological issues with emphasis on theoretical and research literature. (Fall)

227–28 **Seminar: Principles of Psychotherapy** (3–3) Kahn

For graduate students in clinical psychology; open to others, with permission of instructor, only if space permits. Patient's needs and demands on the therapist. Case participation heavily relied upon. **Prerequisite: Psyc 218.** (Academic year)

229 **Seminar: Principles of Behavior Change** (3) Phillips

Stimulus-organism-response variables and their interactions, with emphasis on learning theory as applied to clinical problems. (Fall)

231 **Development of Psychometric Instruments** (3) Mosél

Quantitative techniques and principles used in construction, standardization, and evaluation of personality and ability measures for research and practice; quantification of human judgment for measurement purposes. Prerequisite: course in tests and measurements and an elementary course in statistics. (Fall)

232 **Ego Psychology and Theories of Object Relations** (3) Holmstrom

Emphasis on theoretical contributions of Freud, Hartmann, Kris, Klein, Rapaport, Kernberg and others. Assessment and treatment are addressed primarily with reference to investigations of borderline and characterological disorders. Permission of instructor required for all students except those in clinical psychology. (Spring)

234 **Seminar: Theory of Psychological Measurement** (3) Mosél

Development of classical axiomatic-deductive theory underlying major notions in the construction and evaluation of psychological tests. (Spring)

235 **Seminar: Community Mental Health** (3) Miller

(Formerly Psyc 236)

For graduate students in the department of psychology; open to others, with permission of instructor, only if space permits. Survey of issues and techniques in community mental health; emphasis on educational systems and community mental health issues. Prerequisite: Psyc 219. (Fall)

240 **Seminar: Selected Topics in Psychopathology** (3) Silber

Examination of current research and theory in psychopathology. (Spring)

245 **Seminar: Organizational Behavior** (3) Mosél

Analysis of organizational behavior, emphasis on motivation and productivity. Recent research on employee attitudes, primary group, supervisory leadership, formal and informal organization, job design. (Fall)

246 **Seminar: Personnel Evaluation Techniques** (3) Mosél, Harper

Techniques of personnel selection and performance evaluation. Employment tests, personal data, assessment interviews, performance ratings, and assessment centers. Consideration of federal guidelines in employee selection. Includes practicum.

247 **Seminar: Psychological Tests and Equal Opportunity** (3) Hunt

Technical, professional, practical, and legal demands of psychologi-

...al test use. Current problems of fairness, discrimination against minorities, and test validation. (Summer)

248 **Organizational Behavior Research Applied to Organizational Intervention and Change** (3) Cohen

Emphasis on development of models of organizational effectiveness; design of valid diagnostic instruments; implementation of research strategies; establishment of program evaluation criteria. (Spring, even years)

251 **Seminar: Advanced Social Psychology** (3) Tuthill, Poppen, Green

Current research and theory: motivation and cognition, dissonance, social interaction theory, interpersonal processes, group dynamics, group conflict. (Fall)

252 **Research Methods in Social Psychology** (3) Tuthill, Poppen, White, Green

Selected methods such as public opinion polling, attitude scaling, interviewing, content analysis, naturalistic observation, field research or laboratory experimentation. (Fall and spring)

254 **Seminar: Experimental Social Psychology** (3) Tuthill

Experimental study of small groups, group climates, interaction process analysis. Lewin's field theoretical approach to individual and group processes. (Spring, odd years)

256 **Seminar: Psychological Causes of War** (3) White

An attempt to integrate evidence from animal behavior, child behavior, anthropology, psychiatry, and recent history, including World Wars I and II and the present East-West conflict. (Spring)

257 **Current Topics in Social Psychology** (3) Poppen, Green

Advanced seminar with focus on major theoretical approaches, research, or problem areas within field of social psychology. Topic changes each semester. (Fall and spring)

258 **Seminar: Attitude Change** (3) Tuthill

Review of recent research literature on attitude formation and change. Examination of theories of attitude change and experimental findings. (Spring, even years)

261 **Seminar: International Communication** (3) Mosél, Stewart

Primarily for students in the School of Government and Business Administration and School of Public and International Affairs. Communicating information and effecting attitude change across cultures interpersonally and by mass media.

268 **Seminar: Neuropsychology** (3) Rothblat

Selected problems in research relating the brain and behavior. Independent topics each semester such as sensory processing, brain development and behavior, clinical aspects of nervous system function.

272 **Seminar: Theories of Personality** (3) Caldwell

Emphasis on theoretical problems and methodology in the field of personality study. (Fall, odd years)

274 **Comparative Psychology and Ethology** (3) Caldwell

Synthesis of the principles and findings of ethology and comparative psychology. Examination of the theories and findings of Lorenz

Prehension and Edwin von Uexküll in the light of recent experimental investigations. (Fall, even years)

289 Seminar: Current Topics in Experimental Psychology (3) Staff
Review and discussion of contemporary research and theory in a specialized field of psychological study, by leaders in the field. Independent topics each semester may be repeated for credit. (Fall and spring)

291 Theories of Organizational Behavior (3) Cohen
Examination of current theoretical models and research. (Spring, odd years)

292 **Seminar: Perception** (3) **Walk**
Study of current research and theory in the experimental psychology of perception. (Spring)

293 Seminar: Psychology of Thinking (3) Rice
Review of basic theoretical positions and research concerning the processes of cognition: memory, concept formation, and reasoning.

295 Independent Research in Psychology (3) Staff
Individual library or experimental research under supervision of staff member. Arrangements must be made with supervising staff member prior to registration. May be repeated for credit. (Fall and spring)

299–300 Thesis Research (3–6) Staff
(Fall and spring)

Fourth Group

398 Advanced Reading and Research (arr.) Staff
Limited to students preparing for the Doctor of Philosophy under staff supervision. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) **Staff**
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

PSYCHIATRY AND BEHAVIORAL SCIENCES

The following course offered by the Department of Psychiatry and Behavioral Sciences in the University School of Medicine and Health Sciences is open to graduate students interested in clinical psychology. For detailed description, see School of Medicine and Health Sciences bulletin.

Seminar: Clinical Introduction to Family
Diagnosis and Therapy (3–3)

PUBLIC ADMINISTRATION—GRADUATE PROGRAMS

D.S. Brown, W. Sommers *(Emeritus)*, S.R. Chitwood
Associate Professors B. Fessler, J.L. Wenrich
Professors M.M. Hamon, B.L. Cohen *(Chairman)*, A.E. Merget, [illegible] Walsh, J. Tribble, C.W. Washington
Assistant Professor/Lecturers H.P. Pastin, F.W. Grupp, Jr.

Programs of study in Public Administration leading to the degrees of Master of Public Administration and Doctor of Public Administration are offered by the School of Government and Business Administration (see pages 131–61).

Third Group

205 **Introduction to Public Administration and Management** (3) Brown, Chitwood

Provides frame of reference for study of public administration. Historical development, contemporary approaches, roles of the public manager. Ethics and norms, administrative responsibility and public interest. Management in the public sector. (Fall and spring)

213 **Administration in the Federal Government** (3) Tolchin

Critical analysis of federal administrative organizations as an integral part of the political system. Roles of Congress, the President, the courts, interest groups, political parties and the public in the public decisional process. (Fall and spring)

215 **Law and the Public Administrator** (3) Chitwood

(Formerly PAd 220)

Exploration and analysis of the functions of law in a democratic society. Emphasis is placed upon the procedural, historical and jurisprudential dimensions of American law. This broad perspective seeks to convey understanding of the law as a legal and moral force guiding and constraining public decision making. (Spring)

217 **Seminar: Development Administration I** (3) Staff

The nature of underdevelopment. Specific problems of less developed countries. National cultures and political and administrative systems. The giving of assistance: types of foreign aid; problems of working with aid givers.

218 **Seminar: Development Administration II** (3) Brown

Problem of the transfer of administrative capability from one country to another. Political and administrative development. Unilateral and multilateral approaches. The role of the innovator. Strategies of administrative development.

221 **Organization Theory and the Public Sector** (3) Catron, Harmon, Washington

Analysis of organization theory with special focus on public organizations; current issues in organization theory, decision-making, the organizational environment and the changing nature of organizations in a post-industrial society. (Fall and spring)

223 **Behavioral Factors in Large and Complex Organizations** (3) Brown

Analysis of the nature and characteristics of large organizations. Bureaucracies and their behavioral patterns: dysfunctionalism. Approaches to policy guidance and leadership, particularly in large public organizations. Influence and control systems. Future trends. (Fall and spring)

231 **Public Personnel Administration** (3) Staff

Survey of basic principles and functions of personnel administration in the public service. Roles of personnel management, recruitment, placement, wage and salary administration, training, retirement, and other personnel functions. (Fall)

232 **Problems in Public Personnel Management** (3) Staff

Analysis and evaluation of major personnel management problems in government; employee-management relations; affirmative action policies; bureaucracy and intergovernmental relationships. Impact of automation. Evaluation of personnel systems. (Spring)

233 **Seminar: Manpower Development and Utilization** (3) Porter

Examination of public and private manpower trends, problems, policies and programs. Evaluation of approaches and techniques to the administration of manpower programs. Analysis of impact of economic, political, and social factors on manpower.

235 **Seminar: Technology Change and Professional Human Resource Planning** (3) Roman

Analyses human resource problems arising from automation and other technological change. Evaluation of these developments in government, business, and educational organizations, and their implications for productivity, employment, training and education. Analysis of economic, political, and social factors influencing public and private human resource policies. (Spring)

236 **Labor-Management Relations in the Public Sector** (3) Staff

Principles and current issues in public sector labor relations; collective bargaining and the merit concept, scope of bargaining, representation elections, unfair practices, grievance procedures, bilateralism and the management process.

242 **Administration of State and Local Governments** (3) Washington

(*Formerly PAd 250*)

Examination of state and local governmental structures and functions; public and private demands that place stress on federal system, their limitations, and alternatives available to encourage more effective administration. (Fall and spring)

245 **Intergovernmental Relations** (3) Washington

Assessment of the impacts and consequences of change in the structure of intergovernmental policies and programs in the federal system. Legislative roles and responsibilities of federal, state, regional and local systems will be examined from both theoretical and practical vantage points.

246 **Dynamics of Citizen Participation in Administration** (3) Merget

Examination of the nature of participation in a democratic society. An analysis of the characteristics and dynamics of citizen-based organizations. Exploration of effective methods or models by which administrators may utilize citizen participation.

248 **Financing Local Government** (3) Merget

Analysis of the structure and administration of public finance in local governments. Includes the financing of service through taxation and other revenue sources, debt administration, and investigation of the budgetary process. (Fall and spring)

249 **Urban Public Policy** (3) Washington

Examination of forces at the city. Emphasis on urban systems in their social, political, economic and physical aspects. Against the background of urban politics and administration, will address such central functional areas as health, education, welfare, crime, poverty, transportation and housing. (Spring)

251 Governmental Budgeting (3) Porter

Survey of the basic concepts, principles and practices in governmental budgeting. Interrelationship of planning, programming and budgeting; their role in the management process. (Fall and spring)

252 Public Expenditure Analysis and Planning (3) Merget

Intensive analysis of managerial and economic procedures and techniques used by governmental agencies in planning, allocating and managing scarce resources in the implementation of public programs. Topics discussed include benefit cost analysis, program budgeting systems analysis and present value analysis. (Fall and spring)

253 Public Financial Management Within Federal Agencies (3) Staff

Intensive analysis of the concepts, principles, and general practices of financial management within federal departments and agencies focusing on the interrelationships of financial and program functions and drawing on the several financial disciplines of budgeting, accounting, and auditing.

260 Policy Formulation and Administration (3) Harmon, Tolchin

Normative and analytical models of the policy process; effects of decision-making and institutional arrangements on public policy formulation and implementation. (Fall and spring)

261 Policy Analysis in Public Administration (3) Catron

(Formerly PAd 214)

Introduction to systematic analysis of public policy. Development of conceptual frameworks for differentiating types of public policies (e.g., distributive, regulatory, redistributive). Examination of the roles and limits of analytic techniques in the development, implementation, and evaluation of public policy. (Fall and spring)

262 Seminar: Science, Technology and Public Policy (3) Black

The impact of science and technology upon public administration in terms of both administrative practice and national policies. (Spring)

264 Public Program Evaluation (3) Catron

(Formerly PAd 292)

Theory and practice of program evaluation and evaluative research. Exploration of scope and limitations of current practice in evaluation due to economic, political, social and administrative factors. Examination of methodological considerations for data collection, analysis and dissemination. (Spring)

288 Field Problem Studies in Public Administration (3) Staff

Field research and approved internships on selected issues and aspects of public administration, including specific policy and management problems arising in governmental agencies and related public institutions. Open to Masters students upon completion of 9 hours toward the degree program and with the consent of faculty advisor.

289 Public Program Management and Policy Implementation (3) Staff

A review of the diverse concepts and methods in public administration; an analysis and integration of the salient political, economic, managerial, and leadership values and issues in implementing public policies. Open only to MPA candidates in their final semester of study. (Fall and spring)

290 **Special Topics in Public Administration** (3) Staff
Experimental course offering; new course topics and teaching methods. May be repeated once for credit.

295 **Research Methods** (3) Staff
Theory and practice in research methodology. Data sources and gathering, research models and designs, analysis and testing, controls, interpretation and presentation of findings. (Fall and spring)

296 **Statistical Applications in Public Administration** (3) Staff
[Formerly PAD 395]
Use of statistics and computers in research and program evaluation. Development of basic statistical competency; frequency distribution, graphic presentation, sampling, central tendency, variability, correlation, probability, regression, measurement. Some computer assistance. Prerequisite: PAD [illegible] (Fall and spring)

298 **Directed Readings and Research in Public Administration** (3) Staff
Supervised reading in selected fields within public administration. Admission by permission of instructor. May be repeated once for credit.

299 **Thesis Seminar** (3) **Staff**
Examination of thesis standards, research philosophy and methodology in public administration.

300 **Thesis Research** (3) **Staff**

Fourth Group

Fourth-group courses are primarily for doctoral students and are offered as the demand requires. They are open to other graduate students at the discretion of the department.

311–12 **Seminar: Public-Private Sector Institutions and Relationships** (3–3) Chitwood
An account and critique of alternative theoretical frameworks for describing, understanding and predicting the nature, values, and actions of American public and private institutions. Problems, potentials, and alternatives for structuring public and private institutional arrangements to meet the needs of society.

323 **Seminar: The Large and Complex Organization** (3) Brown
Unique problems of large, complex organizations: public, private, and mixed. Emerging concepts and theories. Selected issues.

373 **Seminar: Public Administration and American Political and Social Institutions** (3) Chitwood
Supervised in-depth study of contemporary literature in selected fields and of research methodology in public administration.

374 **Seminar: Trends in Public Administration Theory** (3) Harmon
Survey of contemporary normative and epistemological issues in public administration theory and practice. Analysis of the past and present influence of logical positivism, behavioralism, humanism, existentialism and phenomenology.

377 **Seminar: Social Action and Public Policy** (3) Catron
Interdisciplinary approach to foundations of public policy with focus on theoretical problems of social action. Interrelation of theory and practice. Decision and management as human actions.

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Public Administration general examination. May be repeated for credit

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Public Administration candidates. May be repeated for credit

PUBLIC AND INTERNATIONAL AFFAIRS

Professors R.H. Davison, J.W. Kendrick, R.B. Thompson, J.N. Mosél, F.H. Michael *(Emeritus)*, J. Aschheim, H.L. LeBlanc, R.K. White *(Emeritus)*, A. Gyorgy, B. Nimer, R.P. Sharkey, C.T. Stewart, Jr., J.W. Robb, H.B. Yakobson, H.C. Hinton, H.M. Sachar, G. Stambuk, H. Solomon, V. Petrov, B.M. Sapin, C. Shih, R.K. Lewis, C. Hsieh, G. Sgur, M. Gordon, P.P. Hill, J.A. Morgan, Jr., R. Thornton, H. Pollack *(Research)*, B. Reich, Y. Kim, R.M. Dunn, Jr., C.A. Moser, M.A. Holman, P.F. Klarén

Adjunct Professors T.F. Carroll, W.H. Lewis

Professorial Lecturers J. Hardt, T. Hsia, B. Ramundo, T.W. Wolfe, E.M. Hadley, J.F. Coates, J.J. Dziak

Associate Professors W.R. Johnson, R.Y. Yin, J.K. McDonald, C.F. Elliott, C.A. Linden, S.J. Wayne, J.M. Lowsdon, H.R. Nau, A.H. Teich, E.O. Pedersen, A.M. Yezer, R.S. Goldfarb, R.L. Cole

Adjunct Associate Professor V.T. Coates

Associate Professorial Lecturer P. True

Assistant Professors G.C.Y. Wang, D.L. Lee, D. Fischer, L.P. Ribuffo, C.M. Aho, J.J. Cordes, S. Shaffer, C. McClintock, R. Sines, A.K. Fitzsimmons, M. Sodaro *(Visiting)*, S. Wolchik *(Visiting)*

Programs of study in Chinese language and literature, East Asian studies (China or Japan), international affairs, Middle Eastern studies, public affairs, and urban affairs leading to the degree of Bachelor of Arts, and programs of study in East Asian studies, international affairs, Latin American studies, Middle Eastern studies, public affairs, Russian and East European studies, and science, technology, and public policy leading to the degree of Master of Arts are offered by the School of Public and International Affairs (see pages 161–79).

RELIGION

Professors R.G. Jones, H.E. Yeide, Jr. *(Chairman)*, D. Wallace, Jr.

Associate Professor A.J. Hiltebeitel

Associate Professorial Lecturer E.S. Jospe

Assistant Professors S.A. Quackenbush, D.A. Altshuler

Assistant Professorial Lecturer D.M. Yeager

Bachelor of Arts with a major in religion *(departmental)*. The following requirements must be fulfilled:

1. The general requirements as stated on pages 72–73, 76–85. Students should consult the departmental adviser regarding courses to be taken to meet the requirements for meaningful initiation into the social sciences and the natural and mathematical sciences.]
2. Prerequisite courses—six hours from among Religion 9, 10, 59, 60.

3 Four required courses in related areas—[a] six semester hours in studies of cultures other than American and English (preferably a foreign language), and [b] six semester hours in either literature, philosophy, or history.

4 Required courses in the major—thirty semester hours including at least twenty-one hours of upper-level courses. Twelve of these hours must be chosen from one of the following religious traditions: Judaism (Rel 103, 107, 113, 114, 115, 116, 184, 186); Christianity (Rel 101, 102, 125, 126, 143, 144, 145, 146, 174, 175); religions of India (Rel 157, 158, 159, 160, 162). Appropriate graduate seminars may be approved as substitutions for advanced-level courses. This program must include Rel 101 and at least one course in each of the following areas: Hebrew Scriptures, New Testament, Eastern religions, Western religions.

An honors thesis course (Rel 191) is available for eligible students.

It is recommended that students include the study of various languages as part of undergraduate programs. Students intending to do graduate specializing in Judaism and Biblical studies should do those specializing in early Christianity (including the New Testament) should do those specializing in the religions of India should do those specializing in the religions of India. All students expecting to enter graduate school are urged to study French or German.

Master of Arts in the field of religion. Prerequisite: the degree of Bachelor of Arts with a major in religion from this University, or an equivalent degree.

In addition to the general requirements, pages 88–96. Of the 24 semester hours required for the master's degree, at least six must be in third-group courses (exclusive of the thesis), at least six must be in a closely related field outside the Department of Religion as approved by the department. The Master's Comprehensive Examination must cover three fields. Examination may cover these fields in three research areas or in three broad fields selected from the following: the Old Testament, the New Testament, history of Christianity, religion in America, religious thought, ethics, sociology of religion, and history of religions. A reading knowledge examination, usually in French or German, is required. Latin, Hebrew, or Greek is appropriate for those students whose fields are in the biblical field and Sanskrit or an Eastern language for those whose field is in the history of religions.

Master of Arts in the field of religious education. Prerequisite: the degree of Bachelor of Arts with a major in religion from this University, or an equivalent degree. The undergraduate program should have included the substance of Religion 101, 102, 191, Psych 11, 12, and 30, or Soc 1 or 11.

In addition to the general requirements, pages 88–96. Of the 24 semester hours required for the master's degree (exclusive of the thesis), at least six must be in third-group courses, a maximum of 12 may be in a closely related field outside the Department of Religion as approved by the department.

Master of Arts in the field of religion and medical care. Prerequisite: (1) the degree of Bachelor of Arts with a major in religion from this University, or an equivalent degree; (2) a first professional theological degree in the ministry or priesthood, and (3) the requirements of entering medical students who have not earned a bachelor's degree but who are pursuing the degree of Doctor of Medicine.

In addition to the general requirements, pages 88–96. The program of study consists of 30 semester hours of approved courses, with or without a thesis. Most of these courses must consist of graduate courses from clinical departments (psychology, psychiatry, health care administration and sociology). The course work in these fields must be distributed as follows: 12 hours in one field, six hours in a second field and at least six hours in clinical education. The Master's Comprehensive Examination must cover three fields selected from the six above, one of which, as approved by the department, must be in the Department of Religion. Supervised clinical education is arranged at the various [illegible] centers of the College [illegible]

may be offered as a tool subject in lieu of the required reading knowledge examination in a foreign language.

Master of Arts in the field of history of religions—Hinduism—(Consortium of Universities program). Prerequisite: the Bachelor of Arts degree from this University with suitable background in the study of religion of South Asia or an equivalent degree.

Required: the general requirements, pages 88–96. The program of study consists of 24 hours of course work (exclusive of thesis) selected from upper-division and graduate courses of member universities of the Consortium as determined by the Department of Religion, including a sequence of four courses in the literature of the Hindu tradition and one course in method in history of religions. The Master's Comprehensive Examination must cover the following: methods in the study of religions, thematic comparisons between the Hindu tradition and at least two other religious traditions, including at least one Western tradition, and a special field in Hindu tradition. A reading knowledge examination in a foreign language, usually in French or German, will be required, and a student must take at least two semesters of either Sanskrit or Pāli in addition to the 30 hours of required courses for graduate credit. More complete information regarding courses and requirements is available from the program adviser, Associate Professor A. L. Hiltebeitel, Department of Religion.

Doctor of Philosophy in the field of American religious history (offered in connection with the Department of History)—Required: the general requirements, pages 88–96. The General Examination must cover four fields, at least two from the Department of Religion (history of religion in America and other early Christianity or European Christianity since 1250) and two from the Department of History (generally American social history and one other).

First Group

9 The Hebrew Scriptures (3) Jones

Historical and literary study of the Hebrew Scriptures (Old Testament) with consideration of development of religious ideas, institutions, and outstanding personalities. (Fall and spring)

10 The New Testament (3) Jones

Study of New Testament literature from the standpoint of occasion, purpose, dominant ideas, and permanent value. Emphasis on approach, structure, and significance of the Gospels and Epistles. (Fall and spring)

21 Religion and Man's Search for Meaning (3) Yeide

Traditional religious concepts, language of contemporary religion, secular western sensibility, and secular intellectual perspectives, and the place of religion in today's society. (Fall)

22 Religion and Contemporary Social Issues (3) Yeide

[Discussion of social problems by biblical reflection; examination of ethical perspectives as stimuli and barriers to social change; emphasis on ways for maximizing social values and seeking change. (Spring)]

23 Judaism: Identities and Ideas (3) Altshuler

Exploration of important practices and beliefs in classical and modern times; study of people and texts which confront tradition and change. (Fall and spring)

57 Eastern Spiritual Movements and the Modern West (3) Staff

Impact of Eastern religions on Western culture (mainly British and American) through the widening of cultural horizons, the lure of the

East, the popularization of the occult, transcendentalism, the "metaphysical movements," and the arrival of gurus and other missionaries from the East. Modern Western influences on Eastern religions as background. (Summer)

59 **Religions of the East** (3) Hiltebeitel

Origins, evolution, and contemporary status in historical context of primitive religions, Hinduism, Buddhism, Taoism, Confucianism, and Shinto. (Fall and Spring)

60 **Religions of the West and Near East** (3) Wallace

History of religion in the ancient world (e.g., Greek) and of Judaism, Christianity, and Islam, including modern developments. (Fall and Spring)

*91 **East Asia—Past and Present** (3) Johnson and Associated Faculty

An interdisciplinary course introducing the student to a comprehensive and integrated understanding of the civilization and present problems of East Asia.

Second Group

101 **Theories in the Study of Religion** (3) Staff

Seminar taught jointly by the faculty of the Department of Religion. Analysis of different ways in which religious phenomena can be approached, theories and discussion of some of the most influential books in the development of the study of religion. (Fall)

103 **The Prophets** (3) Quitslund

Development of prophecy in the Old Testament; cultural, economic, psychological, and religious factors; elements of lasting value in the prophetic teaching. Study of selected prophets. (Spring)

104 **The Life and Thought of Jesus** (3) Quitslund

Comprehensive study of the life and teachings of Jesus with critical attention to sources. (Fall)

105 **The Life and Thought of Paul** (3) Quitslund

Backgrounds of early Christianity; first-century religious and social movements affecting the spread of Christianity; the life and personality of Paul; Paul's presentation of the Christian faith. (Spring)

107 **Rabbinic Literature and Thought** (3) Altshuler

Readings in the Mishna, Talmud, exegetical midrashim and targumim in English translation. Methods of literary and historical analysis introduced and applied. Individual research projects.

111 **Myth, Epic and Novel** (3) Hiltebeitel

Religious themes and images in the hero and their cultural significance in literature, e.g., Indo-European, Hittite, Babylonian narrative traditions; Greek epic and dramatic forms; Milton, Shakespeare, Kafka, Joyce, Faulkner, Borges. (Fall)

113 **Early Post-Biblical Judaism** (3) Altshuler

History of Judaism from the time of Ezra through the formation of normative Judaism in the Christian centuries of the Pharisees, Hellenistic Mysticism, Apocalyptic, Messianism, Sectarianism, Philosophy, and Political Resistance.

* An interdepartmental course offered by the Departments of Religion, East Asian Languages and Literatures, Economics, Geography, and History. Anthropology, Philosophy, and Political Science.

caban revolt, growth of sectarian movements. Herod, ferment against Rome in context of Eastern and Western political currents. Use of primary sources, especially the Bible, Josephus, and rabbinic and noncanonical writings. (Fall)

114 Judaism in the Rabbinic Period (3) Altshuler

From 70 CE through end of rabbinic period. Focus on religious responses to destruction of the Temple, apocalyptic thinking and revolt of Bar Cochba, rabbinic and patriarchal responses to Roman authority; Tannaitic and Amoraic Judaism in Palestine and Babylonia; mystical and folk religion phenomena preserved in art and literature. (Spring)

115 Judaism in the Medieval Period (3) Altshuler

History of relations between Jews and non-Jews. Daily life and education of the ordinary Jew; rabbinical law and interpretation of scripture; Jewish philosophers, mystics, sects and messianic movements.

116 Judaism after Emancipation (3) Altshuler

Transformation of theology and beliefs among Jews beginning with, catalyst of their political emancipation. Responses to beginnings of modernity among Jews in Europe, America, and Israel.

122 Christian Ethics and Modern Society (3) Yeide

Nature and principles of Christian life as developed by the Christian community; problems of personal conduct; application to political, social, and economic institutions.

124 Contemporary Movements in Theology (3) Quitslund

Theological approach and systems of a selected number of modern theologians. (Fall)

126 Western Mysticism (3) Quitslund

Study of the phenomenon of religious experience and of selected mystics in Judaism, Christianity, and Islam.

[illegible] Medicine, Religion, and Healing (1) Yeide

[illegible] current treatment of religion in medical practice [illegible] tion and physician. Concept of the professional, the clergy's role in healing, religious prespective on issues in medical ethics. (Spring) Staff

137 The Land of Israel and the Growth of the Western Religions (3) Wallace

143 Early Christianity and the Spiritual Life of the Ancient World (3)

Rise and development of Christianity in relation to the cultural, philosophic, mystery religions and general religious life of the Greco-Roman world to A.D. 500. (Fall) Wallace

144 Medieval Faith and Symbolism (3)

Christian life and thought in the Middle Ages; mystics, saints, popes, and philosophers. (Spring)

147 Religious Currents in the Renaissance and Reformation (3) Wallace

Transformation of Western man's understanding of his identity and destiny from the end of the Middle Ages to the Age of Reason.

146 **Christianity in the Modern World** (3) Wallace
Changing religious styles and patterns since the Age of Reason as seen in theology, literature, political life, and religious institutions.

*155 **Anthropological Approaches to Religion** (3) Simons, Wagner
Theories of religion developed by anthropologists; survey of world religions with emphasis on [illegible] religious processes and change. (Spring)

157 **Indian Philosophy and Mysticism** (3) Hiltebeitel
Indian speculative and mystical traditions; late Vedic *Upanishads*, Bhagavad Gita, Buddhist, and Hindu soteriological systems. (Fall)

158 **Ancient Indian Literature and Religion** (3) Hiltebeitel
Studies of foundational texts of Hinduism, especially *Rig Veda*, Brāhmaṇas, Mīmāṃsā, including the *Bhagavad Gita*; attention to Hinduism's archaic and seminal themes. (Spring)

159 **Mythologies of India** (3) Hiltebeitel
The lore of Indian gods (Vedic, Puranic), heroes (epics), and holy men (Hindu, Buddhist, Jain, Tantric); ties with Indian caste, cult, cosmology, and spiritual ideals.

160 **Buddhism** (3) Hiltebeitel
Origin, development, and contemporary status of Buddhist life and thought; its impact on Asian culture. (Spring)

161 **Islam** (3)
Origin, development, and contemporary status of Islamic life and thought; its impact on the Near East.

162 **Symbolism in the History of Religions** (3) Hiltebeitel
Religious symbolism, myth, legend, and ritual in the religions of the world; various theoretical analyses.

172 **Religion in American Culture** (3) Wallace
Growth of religious bodies and institutions in relation to American culture, development of religious thought and analysis of the contemporary religious scene. (Fall)

174 **American Judaism** (3) Altshuler
Religious thought and institutions with emphasis on contemporary Judaism. Mythic and ritual life of American Jews, including responses to Israel, changes in the Holocaust, family and community life. (Spring)

181 **Women in Western Religion** (3) Quinsland
Historical, theological and ethical investigation of the image and role of women in Judaism and Christianity; special consideration of the feminist experience, the sexual contributions by religious ethics, use of male/female images and language and controversial issues. (Fall)

184 **The Thought of Martin Buber** (3) Jospe
Basic principles underlying the Life of Dialogue and application of those principles to all stages of life from interpersonal relationships to the religious realm. (Spring)

*Interdepartmental course offered by the Anthropology and Religion Departments.

191 **Senior Honors Thesis** (3) Staff
Required of and open only to undergraduate honors candidates in religion. (Fall and spring)

Third Group

209–10 **Seminar: Biblical Studies** (3–3) Jones
Main problems of Biblical literary, historical, and theological criticism. (Academic year)

213 **Seminar: Judaism in Late Antiquity** (3) Altshuler
Historical and religious development of Judaism as seen in the Apocrypha, Pseudepigrapha, Dead Sea Scrolls, Philo and early Rabbinism.

222 **Seminar: Christian Ethics** (3) Yeide
Important humanities in official reflection on the contemporary Christian (Greek) conditions of moral advance in our culture.

235 **Seminar: Roman Catholicism in the Modern World** (3) Quitslund
Important leaders and their ideas in selected developments since 1800—doctrinal, spiritual, biblical, liturgical, and ecumenical.

237 **Seminar: Theological Analysis** (3) Quitslund
Historical and topical study of the development of important ideas in such areas as Christology, soteriology, and eschatology. (Spring)

238 **Seminar: Contemporary Jewish Religious Thought** (3) Altshuler
Selected topics. (Fall)

262 **Seminar: History of Eastern Religions** (3) Hiltebeitel
Selected topics.

271 **Seminar: American Religious History to 1830** (3) Wallace
Religious thought and life during the Colonial and early National period. (Fall)

273 **Seminar: American Religious History since 1830** (3) Wallace
Religious thought and life from the Civil War to the present.

291–92 **Readings and Research** (3–3) Staff
Investigation of special problems. (Academic year)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

ROMANCE LANGUAGES AND LITERATURES

Professors J.W. Robb, G.E. Mazzeo *(Chairman)*, J.A. Fay, J.L. Métivier, Jr., J.F. Burks
Associate Professors M.A.B. Cortland, P.G. Sáenz, C. Ludlow, S.R. Barnett
Assistant Professors G.P. Hovet, J.E. Hicks, I. Azar, J.M. Thibault
Adjunct Assistant Professor M. Cruz-Sáenz

Bachelor of Arts with a field of study major in (1) French language and literature, (2) Spanish language and literature, (3) Spanish-American literature, or (4) any approved combination selected from two of the preceding fields. The following requirements must be fulfilled:

1. The general requirements as stated on pages [illegible] (Students should consult the departmental adviser regarding courses to be taken in satisfying the requirements for meaningful initiation into the social sciences and the natural and mathematical sciences.)

2. Prerequisite courses.—Fren 1–2, 3–4, 9–10, or equivalent, or Span 1–2, 3–4, 9–10, or equivalent.

3. Required introductory literature courses.—Fren 51–52 or 91–92, or Span 51–52 or 91–92.

4. Required for the major:

There is no specific program of required courses. The student however is expected to demonstrate a knowledge of his or her field in breadth and depth by passing a comprehensive examination at the end of the senior year. A proseminar is required as follows: Fren 199–200 for French language and literature majors; Span 199–200 for Hispanic language and literature majors.

Master of Arts in the fields of (1) French literature, (2) Spanish literature, (3) Spanish-American literature, or (4) an approved combination of Spanish and Spanish-American literatures.—Prerequisite: the degree of Bachelor of Arts in the appropriate field from this University or an equivalent degree.

Required: the general requirements, pages 88–89. The program of study consists of 24 semester hours of approved graduate work plus a thesis (equivalent to six semester hours), or, with the approval of the department, a student may elect a program of study consisting of 30 semester hours of approved courses work without a thesis.

Doctor of Philosophy fields of study in Romance literatures.—Required: the general requirements, pages 88–91, 93–95. There are two fields: French literature; Spanish literature, Spanish-American literature, and any approved combination of French, Spanish, or Spanish-American literature.

Bachelor of Arts in Education with teaching fields in French and in Spanish.—Prerequisite: the education curriculum, pages 111–12.

Required: the French option or the Spanish option and the professional courses listed on pages 115–16

Placement Examinations: A student who has not been granted advanced standing and who wishes to continue in college the language begun in high school must take a placement examination before registration. Upon completion of the examination, assignment is made to the appropriate course.

FRENCH

Departmental prerequisite: Fren 3–4 or 6, or equivalent, is prerequisite to all courses in French from Fren 9 and above, except for courses offered in English translation.

First Group

1–2 First-year French (3–3) Huvé and Staff

A year course, credit toward a degree at this University given on completion of Fren 2. For beginners. Pronunciation, conversation, grammar, composition, readings. Oral practice in language laboratory. Laboratory fee $17.50 per semester. (Fall and spring)

3–4 Second-year French (3–3) Huvé and Staff

A year course, credit toward a degree at this University given on completion of Fren 4. Conversation, grammar, composition, reading

in modern French prose. Oral practice in language laboratory. Prerequisite: Fren 1–2. Laboratory fee $17.50 per semester. (Fall and spring)

6 Second-year French (6) Huvé and Staff

Lecture (3 hours), discussion (3 hours). Intensive course which covers material of Fren 3–4. Prerequisite: Grade of *B* or better in Fren 2. Laboratory fee $17.50. (Fall and spring)

9 Expression orale du français contemporain (3) Thibault and Staff

Emphasis on conversation in a controlled situation. Special attention to the acquisition and active use of a flexible vocabulary. Oral reports. Prerequisite: Fren 4 or equivalent. (Fall and spring)

10 Cours de syntaxe (3) Thibault and Staff

Grammar composition, study of vocabulary and syntax. Prerequisite: Fren 4 or equivalent. (Fall and spring)

49 French for Graduate Students (0) Burks and Staff

For graduate students preparing for reading examinations. No academic credit. Course is charged at the rate of three credit hours plus University Center fee. (Fall and spring)

51–52 Survey of French Literature (3–3) Métivier

Readings in French literature from the Middle Ages to the present. Lectures, writings and theatrical excursions. (Fall and spring)

60 Contemporary French Civilization (3) Ludlow

Study of contemporary France as seen through its cultural patterns and economic and social life, its geography, important personalities and principles. Class meeting and discussion of texts supplemented by films, films-fixes and records. Conducted in English.

91–92 Analyse de texte (3–3) Thibault

Methodology and vocabulary of literary criticism; application of principles to explication de texte to selections from representative drama and poetry from the Renaissance to the present. (Alternate years)

Second Group

103 Diction, phonétique appliquée (3) Huvé

The sound of French; elements of articulatory phonetics. Exercises in reading and speech with attention to pronunciation, accent, rhythm, and intonation. (Fall)

108 Cours de grammaire avancée (3) Thibault

(Spring)

109 La Langue pratique (3) Thibault and Staff

Advanced level study, [illegible] and everyday conversation [illegible] through systematic drills of grammatical patterns. (Fall and spring)

110 Cours de stylistique (3) Thibault and Staff

Advanced study of vocabulary and syntax with emphasis on stylistic devices and techniques of composition. (Fall and spring)

119–20 French Literature of the Middle Ages and the Renaissance (3–3) Métivier

Literary history and the development of ideas. *Les chansons de geste*,

courtly literature, satire, the theater, lyric and didactic poetry, Rabelais, Montaigne, La Pléiade. Close analysis of texts, collateral readings. (Academic year)

121–22 **17th-Century French Literature** (3–3) Burks
Drama, fiction, poetry, criticism and philosophy in the Age of Classicism.

123–24 **18th-Century French Literature** (3–3) Ludlow
History, philosophy, criticism, letters, drama, fiction, poetry, the "salons," idea of progress, idea of science. Close analysis of texts, collateral reading. (Academic year)

125–26 **19th-Century French Literature** (3–3) Frey, Thibault
Poetry, drama, and novel of the 19th century; emphasis on stylistic analysis. Offered in French, 1979–80 and alternate years; offered in English translation, 1980–81 and alternate years. (Academic year)

127–28 **20th-Century French Literature** (3–3) Ceffaud, Thibault
Fiction, poetry, and drama from 1900 to present. Chronological examination of authors, movements. Offered in English translation, 1979–80 and alternate years; offered in French 1980–81 and alternate years. (Academic year)

130 **Correspondences between Art and Literature** (3) Thibault
Expression of common preoccupations in diverse media. Readings, slides, lectures, and informal discussions. Topic to be announced in the *Schedule of Classes*. May be repeated for credit. (Summer)

133 **Seminar: French Literature** (3) Staff
Topic to be announced in the *Schedule of Classes*. May be repeated for credit. (Summer)

151 **Cinema and Literature** (3) Thibault
Interaction between the film and literature; aesthetic theories of the surrealists, and their applications to the film and literary genres. Selected films and readings. May be repeated for credit. Conducted in English. (Summer)

199–200 **Proseminar: Readings for the Major** (3–3) Staff
Required of all majors. Conferences and group discussions. (Academic year)

Third Group

202 **Thème et version** (3) Ludlow
Limited to students in the Graduate School of Arts and Sciences; open to others only by permission of the graduate advisor. Required of all graduate students in the field of French language and literature. Analysis and translation of selected prose passages, stressing the differences between French and English; designed to teach students to write with precision and clarity. (Fall)

213–14 **Medieval French Literature** (3–3) Cruz-Sáenz
French literature to the end of the Middle Ages. Prerequisite: a second-group course in French literature.

221 **Special Problems in 16th-Century French Literature** (3) Burks
May be repeated for credit.

226 **16th- and 17th-Century Philosophical Literature** (3) **Burks**
[illegible] of a literature of ideas emphasis on the thought of Calvin, Montaigne, Descartes, and Pascal.

229–30 **Literary Renaissance in Europe** (3–3) **Burks**
Study of the developments in the poetry of Italy, France, and England.

231–32 **Theater in the 17th Century** (3–3) **Burks**
Survey of the development of theatrical arts and the drama. Research papers and reports. (Academic year)

234 **17th-Century Nondramatic Literature** (3) Ludlow
Study of the poetry, novel, and moral writings of the Baroque and Classical periods.

241 **The Age of Enlightenment in Europe** (3) Ludlow
(Formerly The Antiquities Current in the 18th Century)
The contribution of the philosophes to the intellectual evolution of France and Europe. Emphasis on the relations between French, English, and German thought. Readings in English and French.

242 **Seminar: the French Novel and Theater in the 18th Century** (3) Ludlow
Major 18th-century French novelists and dramatists and a comparison of their views with those of some English and German writers of the period. Readings in English and French.

244 **Special Problems in 18th-Century French Literature** (3) Ludlow
Topic for 1980: Libertinism and Utopianism. May be repeated for credit. (Spring)

247 **Special Problems in 19th-Century French Literature** (3) Frey
Topic for 1979: Zola. May be repeated for credit. (Fall)

250 **Special Problems in 19th-Century French Poetry** (3) Frey
Topic for 1980: Romantic poetry. (Spring)

264 **Seminar: Modern Period** (3) Cofflan[illegible]

267 **20th-Century French Theater** (3) Cofflan[illegible]
Issues of the development of the theater from 1896 to the present. (Spring)

268 **20th-Century French Poetry** (3) Cofflan[illegible]
Background and development of poetry in the 20th century; explication de texte approach. (Fall)

295 **Independent Reading and Research in French Literature** (arr.) Staff
For students preparing for the Master of Arts degree. May be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

Fourth Group

George Washington University is a member of the Folger Institute of Renaissance and 18th-century English literature [illegible] com-

301–308 **Folger Institute Seminar** (3 each) Staff
Topics will be announced

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

ITALIAN

First Group

1–2 **First-year Italian** (3–3) Coffland and Staff
A year course; credit toward a degree at this University given on completion of Ital 2. For beginners. Pronunciation, conversation, grammar, composition, readings. Oral practice in language laboratory. Laboratory fee, $17.50 per semester. (Academic year)

3–4 **Second-year Italian** (3–3) Coffland and Staff
A year course; credit toward a degree at this University given on completion of Ital 4. Conversation, grammar review, composition, reading of modern Italian prose, introduction to Italian civilization. Oral practice in language laboratory. Laboratory fee, $17.50 per semester. (Academic year)

9–10 **Italian Conversation and Composition** (3–3) Coffland
Prerequisite: Ital 4 or equivalent and permission of instructor. (Academic year)

11 **Italian through Opera** (3) Chambers
Conversational Italian presented through excerpts from operas and their libretti. Pronunciation and grammatical principles, vocabulary, and conversation. (Spring)

Third Group

295 **Independent Reading and Research in Italian Literature** (arr.)
For students preparing for the Master of Arts or Doctor of Philosophy degree. Not to exceed 6 credits. (Fall and spring)

PORTUGUESE

First Group

31–32 **Intensive Portuguese** (3–3) Robb
Prerequisite: knowledge of one other Romance language. (Academic year)

SPANISH

Departmental prerequisite: Span 3–4 or 6, or equivalent, is prerequisite to all courses in Spanish, from Span 9 and above, except for courses offered in English translation.

First Group

1–2 First-year Spanish (3–3) — Hicks and Staff

A year course credit toward a degree at this University given on completion of Span 2. For beginners. Pronunciation, conversation, grammar, composition, readings. Oral practice in language laboratory. Laboratory fee, $17.50 per semester. (Fall and spring)

3–4 Second-year Spanish (3–3) — Hicks and Staff

A year course: credit toward a degree at this University given on completion of Span 4. Conversation, grammar review, composition, reading of modern Spanish prose. Oral practice in language laboratory. Prerequisite: Span 1–2. Laboratory fee, $17.50 per semester. (Fall and spring)

6 Second-year Spanish (6) — Hicks and Staff

Lecture (3 hours), discussion (3 hours). Intensive course which covers material of Span 3–4. Prerequisite: grade of B or better in Span 2. Laboratory fee, $17.50. (Fall and spring)

9–10 Spanish Conversation and Composition (3–3) — Azar and Staff

Conversation, composition, vocabulary, and syntax. Prerequisite: Span 4 or equivalent. (Fall and spring)

12 Spanish Conversation and Composition (Intensive) (6) — Azar and Staff

Intensive, accelerated course which covers the material of Span 9–10. Laboratory fee, $25. (Academic year)

20 Prensa y Cultura: Intensive Spanish Conversation (3) — Azar and Staff

Intensive conversation organized around specific contemporary topics; illustrated by periodical material, films and interviews. (Summer)

49 Spanish for Graduate Students (0) — Hicks and Staff

For graduate students preparing for reading examinations. No academic credit. Tuition is charged at the rate of three credit hours plus University Center fee. (Fall and spring)

51–52 Survey of Spanish Literature and Civilization (3–3) — Barnett

Social, artistic, and cultural background of Spanish literature. Lectures, readings, recitations, and informal discussions. (Academic year)

91–92 Explicación de Textos (3–3) — Sáenz

Analytical introduction to Spanish and Spanish-American literature. Method demonstrated and practiced on selected passages. (Academic year)

Second Group

109–10 Advanced Spanish Conversation and Composition (3–3) — Mazzeo

Development of writing and speaking skills. Emphasis on diction and style. Prerequisite: Span 10 or equivalent. (Academic year)

119–20 **Medieval Spanish Literature** [3–3] Cruz-Sáenz
Survey by genre of the literature of the Middle Ages.

121–22 **Spanish Literature of the Golden Age** [3–3] Azar
Span 121: poetry and drama; Span 122: prose. (Academic year)

123–24 **Cervantes: Don Quijote** [3–3] Azar
The Quijote and the novel as a literary genre; reality and fiction

125–26 **Modern Spanish Literature** [3–3] Mazzeo
Prose, poetry, and drama of the 18th and 19th centuries. Class analysis of texts, collateral readings, lectures on literature and history.

127–28 **Contemporary Spanish Literature** [3–3] Sáenz
Prose, poetry, and drama of the 20th century. Class analysis of texts, collateral readings, lectures on literature and history. (Academic year)

130 **The Modern Spanish Essay** [3] Mazzeo
Development of the Spanish essay from the 16th through the 20th centuries, emphasis on the 19th and 20th centuries. Class analysis of texts, collateral readings, and lectures. (Summer)

131 **Feminist Authors in Hispanic Literature** [3] Mazzeo
Development of feminist themes in Hispanic literature. Class analyses of representative works with readings in Spanish or in English translation. (Summer)

137 **The Spanish Civil War and the Creative Artist** [4] Barnett
Historical and literary study of the Spanish Civil War and the subsequent artistic reaction in Spain, Great Britain, France and the U. S. Taught in English with readings in Spanish or English. (Summer)

141 **New Spanish-American Narrative** [3] Rabb
Short stories of Borges, Cortázar, Fuentes, Arreola, Carpentier, García Márquez. (Summer)

142 **Latin America: A Literary-Cultural View** [3] Rabb
Contemporary Latin America as culture and history as seen through its writers. (Summer)

151–52 **The Spanish-American Novel** [3–3] Robb
Development of the novel in Spanish America. Literary, cultural readings, and class analysis of texts.

155–56 **Spanish-American Literature to 1880** [3–3] Robb
Literature of Spanish America from the colonial period to the latter part of the 19th century. Lectures, collateral readings, reports, and class analysis of important works.

157–58 **Spanish-American Literature since 1880** [3–3] Robb
Literature of Spanish America from 1880 to the contemporary period. Lectures, collateral readings, reports, and class analysis of important works. (Academic year)

199–200 **Proseminar: Readings for the Major in Hispanic Language and Literatures** [3–3] Barnett
Required of all majors. Conferences and group discussions. (Academic year)

Third Group

215 **Seminar: Medieval Literature** (3) Cruz-Sáenz
(Fall)

221 **Seminar: Cervantes' "Don Quijote"** (3) Azar
Cervantes' literary theories, the *Quijote* and its relations with the other novelistic narratives as different modes of representing reality in literary fiction.

224 **Seminar: "La Celestina"** (3) Azar

225 **Seminar: Special Problems in Golden-Age Literature** (3) Azar
Topic for 1979: 16th-century literature; topic for 1980: 17th-century literature. May be repeated for credit. (Fall)

231 **Seminar: 18th-Century Spanish Writers** (3) Mazzeo
Lectures and analysis of principal authors and works; relationships with subsequent literary movements. (Fall)

242 **Seminar: Spanish Romanticism** (3) Mazzeo
Lectures and analysis of principal authors and works. Collateral readings. Problems of origins and development. (Spring)

244 **Seminar: Naturalism and the Spanish Novel** (3) Mazzeo
Development of Naturalism in 19th-century Spain. Analysis of representative works of Pardo Bazán, Clarín, Blasco Ibáñez, and others.

246 **Seminar: Works of Galdós** (3) Barnett
Ideological and stylistic analysis; relationship of Galdós' works to literary movements of the second half of the 19th century.

248 **Seminar: Spanish Lyric Poetry of the 20th Century** (3) Sáenz
Stylistic analysis of the most significant poets from 1898 to the present.

250 **Seminar: Novecentismo y Literatura de Entreguerras** (3) Sáenz
The prose writers: intellectualism and new forms of expression. (Spring)

251 **Seminar: Works of Unamuno and Ortega y Gasset** (3) Sáenz
Study of the thought of Unamuno and Ortega y Gasset; analysis and commentary on the texts. (Fall)

252 **Spanish Literature since the Civil War** (3) Sáenz
Development of the Spanish novel since 1939.

253 **Seminar: Studies in Modern Spanish-American Poetry** (3) Robb
Poetic trends stressed in selected poets and groups of poets from the Modernists through Post-modernists and Vanguardists to the present.

255 **Seminar: Studies in 20th-Century Spanish-American Theater** (3) Robb
Trends in modern theater with emphasis on Mexico, Central America, Puerto Rico, Chile, and the Río de la Plata area.

256 **Seminar: Studies in Mexican Narrative Prose** (3) Robb
Study of the emergence and development of the "New Mexican Nar-

[illegible] through the works of Vaca, Rulfo, Arreola, Fuentes, Leñero, and others.

261 **Seminar: Studies in the Spanish-American Short Story and Essay** (3) Robb

The Spanish-American short story and essay as artistic forms; selected modern short story writers and essayists. (Fall)

264 **Seminar: Studies in Recent Spanish-American Fiction** (3) Robb

The [illegible] Spanish-American Narrative" studied in the novels and short stories of Borges, Bioy Casares, Lezama, Vargas Llosa, García Márquez, Carpentier, Cabrera Infante, and others

266 **Seminar: Alfonso Reyes: Essayist, Poet, Narrator** (3) Rivers

Alfonso Reyes' essayistic, poetic, narrative and complete literary activity studied in his various prose and poetic works. (Spring)

287 **Seminar: Problems in Latin-American Civilization** (3) Staff

Interdisciplinary seminar partially guided by a specialist within the methodology of the various disciplines; each student writes a report on some aspect of a selected key theme. Admission by permission of instructor. (Spring)

295 **Independent Reading and Research in Spanish and Spanish-American Literature** (arr.) Staff

For students preparing for the Master of Arts degree. May be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3) **Staff**

(Fall and spring)

Fourth Group

398 **Advanced Reading and Research** (arr.) Staff

Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff

Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

SANSKRIT

See **Germanic Languages and Literatures.**

SCANDINAVIAN

See **Germanic Languages and Literatures.**

SERBO-CROATIAN

See **Slavic Languages and Literatures.**

SERVICE-LEARNING PROGRAM*

Professor A.B. Cambel†
Associate Professor S. Greene
Adjunct Associate Professor L.J. Lear *(Coordinator)*
Assistant Professors H. Nashman, N.C. Garner
Faculty Associate D.J. Lynn
Adjunct Instructor P.E. Wallace, Jr.

151 **Urban Legal Services** (6) Wallace

Field work (16–20 hours per week) and academic study of the urban legal system. Role of urban legal system in promoting human values and enhancing social change. Admission by permission of instructor. (Fall and spring)

152 **Human Resource Issues in Education** (6) Nashman

Exploration of the effects of education on society and vice versa; opportunities for community, state, and service (16–20 hours per week) in public, private, nonprofit, hospital, and community education sectors. Admission by permission of instructor. (Fall and spring)

153 **Issues in American Health Care** (6) Lynn

Field work combined with academic study of present American health care system and its problems: cost, quality of care, delivery of health care, ethical issues, health education, consumer issues, etc. Field placements (16–20 hours per week) in appropriate health-related activities. Admission by permission of instructor. (Fall and spring)

154 **Independent Study** (3 or 6) Lear

Field work combined with academic study involving field placements and complementary academic program of study, under the supervision of an appropriate faculty member. Students must "contract" with the agency, the faculty member, and the Service-Learning Program. Admission by permission of instructor. (Fall and spring)

155 **The Arts and their Audiences** (6) Garner

Studies in the purpose and operation of the arts organizations in Washington. Weekly seminars and placement in an internship in an arts organization (16–20 hours per week). Discussion topics include the process of communication between artists and the public, the government and the business community. Open to students with a demonstrated interest in the arts and the necessity to perform in a responsible position in an arts organization. (Fall and spring)

156 **Community Planning and Development** (6) Greene

Field work combined with academic study of the role of urban and regional planning in analyzing and responding to the needs of a public urban society. Field placements (16–20 hours per week) in a public agency or in the private sector. Admission by permission of instructor. (Fall and spring)

157 **Social Issues in Engineering** (3) Cambel

Provides the opportunity to explore social policy and value issues within the engineering profession. Students must enroll co

* Administered by the Division of Experimental Programs.
† [illegible] Engineering and Applied Science

in EngS 306. Seminars will focus on energy and field placements (10–20 hours per week) will be in energy-related offices. Admission by permission of instructor. (Fall and spring)

SINO-SOVIET STUDIES

See Institute for Sino-Soviet Studies.

SLAVIC LANGUAGES AND LITERATURES

Professors H.B. Yakobson, C.A. Moser
Associate Professors N.N. Natov, C.A. Olkhovsky (Chairman), W.W. Rowe, I. Thompson
Adjunct Assistant Professor M.F. Miller
Assistant Professorial Lecturer S. Ficks

Bachelor of Arts with a major in Russian language and literature (field of study or department)—The following requirements must be fulfilled:

1. The general requirements as stated on pages 72–73, 79–85.
2. Prerequisite courses—Slav 5–6 (preferred), or Slav 1–2, 3–4; or equivalent; and Slav 91–92.
3. Required for the major:

Course of study: By the end of the senior year the student will be expected to have a reasonable command of language skills and a grasp of the fundamentals of Russian structure, as well as a good foundation in Russian literature and culture. The passing of a written examination during the senior year is required. The department provides a proseminar to assist the student in preparation for the major examination.

Departmental major—from 30 to 39 semester hours of course work in the department of Slavic Languages and Literatures distributed as follows: Language—12 to 15 hours chosen from Slav 5–6, 101–102, 103–104, 105–106, 107–108, and Conversation; 12 hours chosen from Slav 111–112, 113–114, Literature in Translation; 6 hours chosen from Slav 141–142, 181–182, Literature in English; 6 to 9 hours chosen from course group courses.

3. A student who is already proficient in Russian language or literature may, upon passing an appropriate examination, waive one or all of the language and literature courses, as well as up to six semester hours of course group courses.

Bachelor of Arts with a major in Russian literature and culture—in translation (field of study)—The following requirements must be fulfilled:

1. The general requirements as stated on pages 72–73, 79–85.
2. Prerequisite courses—Slav 47 and 49, or Slav 1–2 and 3–4, or equivalent; and Slav 91–92.
3. By the end of the senior year the student will be expected to have a good grasp of Russian literature and the principles of literary criticism, as well as a general knowledge of Russian culture and history. The passing of a written examination during the senior year is required. The department provides a proseminar to assist the student in preparation for the major examination.
4. A student who is already proficient in Russian language or literature may, upon passing an appropriate examination, waive one or all of the language and literature courses, as well as up to six semester hours of course group courses.

Master of Arts in the field of Russian language and literature. Two areas of concentration are offered: Russian language and literature, and Russian language and linguistics.

Prerequisite: the degree of Bachelor of Arts with a major in Russian language and literature or Russian literature and culture in translation from this University, or an equivalent degree. A student planning a concentration in Russian language and literature must have a general proficiency in the Russian language, a general knowledge of Russian literature and an acquaintance with Russian history and culture. A student planning a concentration in Russian language and linguistics must have a general proficiency in the Russian language, a general knowledge of its structure, and an acquaintance with general linguistics.

Required: the general requirements, pages 86–96. The program of study consists of 24 semester hours of approved course work plus a thesis (equivalent to six semester hours) or 30 semester hours of approved course work without a thesis. Candidates electing the Russian language and literature concentration must include six semester hours of linguistics and at least 12 hours of literature; candidates electing the Russian language and linguistics concentration must include six semester hours of literature and at least 12 hours of language and linguistics. All candidates must pass a reading knowledge examination in either French or German and must pass a Master's Comprehensive Examination.

Bachelor of Arts in Education with a teaching field in Russian—Prerequisite: the education curriculum, pages 111–12.

Required: the Russian option and the professional courses listed on page 116.

Placement Examination: A student who has not been granted advanced standing and who wishes to continue in college the language begun in high school must take a placement examination before registering. Upon completion of the examination, assignment is made to the appropriate course.

First Group

1–2 First-year Russian (3–3) Yakobson and Staff

Beginners' course in fundamentals of grammar and pronunciation. Slav 1 is prerequisite to Slav 2. Laboratory fee, $17.50 per semester. (Fall and spring)

3–4 Second-year Russian (3–3) Yakobson and Staff

Intermediate course in Russian language. Prerequisite to Slav 3: Slav 1–2 or two years of high school Russian. Prerequisite to Slav 4: Slav 3. Laboratory fee, $17.50 per semester. (Academic year)

5–6 Intensive Beginning Russian (6–6) Thompson and Staff

Classroom (7 hours), laboratory (1 hour). Beginners' intensive course in the fundamentals of Russian. Prerequisite to Slav 6: Slav 2 or 5. Laboratory fee, $17.50 per semester. (Academic year)

9–10 Intermediate Russian Conversation and Composition (3–3) Yakobson

Listening comprehension; oral and written practice. Prerequisite: Slav 4 or 6, or permission of instructor. (Academic year)

31–32 Elementary Polish (3–3) Staff

Beginners' course in the fundamentals of grammar and pronunciation. Prerequisite to Slav 32: Slav 31 or equivalent. Laboratory fee, $17.50 per semester. Offered if enrollment is sufficient.

41–42 **Elementary Serbo-Croatian** (3–3) Staff

Beginners' course in the fundamentals of grammar and pronunciation. Prerequisite to Slav 42: Slav 41 or equivalent. Laboratory fee, $17.50 per semester. Offered if enrollment is sufficient.

47 **Beginning Russian for Reading** (3) Moser

For undergraduate and graduate students with little or no Russian who wish to acquire a reading knowledge of the language. No academic credit for graduate students. (Fall)

49 **Russian Reading** (3) Moser

Primarily for graduate students preparing for reading examinations. No academic credit for graduate students. Prerequisite: Slav 47 or equivalent. (Spring)

51–52 **Elementary Bulgarian** (3–3) Moser

Beginners' course in fundamentals of grammar and pronunciation. Prerequisite to Slav 52: Slav 51 or equivalent. Laboratory fee, $17.50 per semester. Offered if enrollment is sufficient.

71 **Introduction to Russian Civilization** (3) Olkhovsky

Survey of Russia's artistic, social and cultural development. Lectures, discussion, visual aids—in English. (Fall)

91–92 **Introduction to Russian Literature** (3–3) Moser

Emergence and development of Russian literature and ideas during the 19th and early 20th centuries—in English. [Academic year]

Second Group

101 **Readings in the Soviet Press** (3) Ficks

Representative reading and translation of Soviet periodicals and current publications in social sciences. Prerequisite: Slav 4 or 6, 40 or permission of instructor. (Fall)

103 **Scientific Russian** (3) Ficks

Representative readings in the major fields of Russian contemporary scientific literature. Prerequisite: Slav 4, 6, 40 or permission of instructor. (Spring, even years)

104 **Business Russian** (3) Ficks

Study of Russian business vocabulary and concepts of business in the Soviet context. Prerequisite: Slav 4, 6, 40 or permission of instructor. (Spring, odd years)

109–10 **Advanced Russian Conversation and Composition** (3–3) Yakobson

Developing proficiency in oral and written expression. Prerequisite: Slav 10 or equivalent. [Academic year]

128 **Dostoevsky: The Man and the Artist** (3) Nátov

Sources and development of Dostoevsky's philosophical, religious and aesthetic ideas. His influence on Russian and Western literature. Lectures, discussions, and reports—in English. (Fall)

141–42 **19th-Century Russian Literature** (3–3) Staff

Readings of representative texts: poetry, prose, drama in Russian. Prerequisite: Slav 4 or 6, or equivalent. [Academic year 1966–67]

143–44 **The Russian Novel** (3–3) Moser
Study of representative novels of the 19th and 20th centuries—in English. (Academic year 1980–81 and alternate years)

146 **The Russian Short Story** (3) Natov
Historical development of the Russian short story. Lectures, reports, and class analysis—in Russian. (Spring, odd years)

151–52 **20th-Century Russian Literature** (3–3) Natov
Readings of representative texts: poetry, prose, drama—in Russian. Prerequisite: Slav 4 or 6, or equivalent. (Academic year 1979–80)

156 **Leo Tolstoy: His Life and Works** (3) Rowe
Evolution of Tolstoy's artistic and philosophical ideas. Tolstoy's impact on Russian literature and society. Lectures, reports, and classroom analysis of his major works—in English. (Spring)

157 **Nabokov** (3) Rowe
Reading and discussion of the major creative works. Russian roots, ordering of reality, sexual symbolism—in English. (Fall)

161–62 **Russian Culture** (3–3) Olkhovsky
Survey of Russian cultural heritage from origins of ancient Russia to present—in English. Lectures, discussions, reports. (Academic year)

165 **Soviet Literature from the Revolution to World War II** (3) Natov
Lectures, discussions, reports—in English. (Fall)

166 **Soviet Literature from World War II to the Present** (3) Natov
(Spring)

172 **Soviet Dissent** (3) Olkhovsky
(Spring)

176 **Women in Russian Literature** (3) Staff
cussion of major works by Russian women writers—in English. (Spring, even years)

191 **Russian Literature to 1800** (3) Moser
the 18th century—in English

195 **Special Problems in Russian** (3) Thompson
Staff

197–200 **Proseminar: Readings for the Major** (3–3)
Conferences and group discussions. (Academic year)

Third Group

211 **Russian Phonology** (3) Thompson
sian. (Fall)

212 **Russian Morphology** (3) Thompson
Linguistic analysis of the morphology of standard contemporary Russian. (Spring)

213 **Russian Syntax** (3) Thompson
(Formerly Russian Linguistic Structure I: Phonology and Morphology)
Linguistic analysis of the syntax and semantics of standard contemporary Russian. (Fall)

214 **Methodology of Teaching Russian** (3) Thompson
(Formerly Russian Linguistic Structure II: Syntax, Lexicon, and Semantics)
Survey of modern methods, techniques, and materials for teaching Russian as a foreign language; examination of textbooks; classroom observation; practice teaching. Prerequisite: 12 semester hours of Russian language. (Spring)

215 **Russian Historical Grammar** (3) Moser
(Formerly History of the Russian Language)
An analysis of the historical development of Russian phonology, morphology, and syntax. (Fall, odd years)

218 **History of the Russian Literary Language** (3) Moser
The development of the norms of the Russian literary language from earliest times to the present. (Spring, even years)

220 **Russian Stylistics** (3) Natov
Analysis of various styles of contemporary Russian from the point of view of structure and lexicon. (Spring, odd years)

225 **Pushkin and the Poets of his Time** (3) Natov
Pushkin's predecessors. Pushkin's poetry and drama. Lermontov—the heir to Pushkin's poetic tradition. (Fall, odd years)

253 **Seminar: Literary Criticism** (3) Natov
Study of leading Russian critics and their role in the development of Russian literature, the emergence of various literary schools. (Spring, even years)

254 **Seminar: Literary and Intellectual Currents of the 1860s** (3) Moser
Discussion of literary and intellectual developments in the Russia of the 1860s. Reading knowledge of Russian required. (Spring, odd years)

255 **Seminar: Main Trends in 20th-Century Russian Literature** (3) Natov
Study of representative works since 1900, their artistic and social value—in Russian. (Fall, even years)

295 **Independent Reading and Research** (arr.) Staff
For students preparing for the Master of Arts degree. May be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3)
(Fall and spring)

SOCIOLOGY

Professors R.W. Stephens, J.H. Cleij, R.G. Brown, T.F. Courtless, Jr., P.H.M. Lengermann, R.A. Wallace
Associate Professors J. Heinzer, P.L. Stewart (*Chairman*), J.L. Tropea
Adjunct Associate Professor G. Wisan
Assistant Professor M.E. Boeskamm

Bachelor of Arts with a major in sociology (departmental)—Three categories of majors are offered: (a) general major; (b) special concentration in crime, [illegible] special concentration in public policy; Options (a) and (b) require departmental approval. The following requirements must be met by all majors except [illegible]:

1. The general requirements as stated on pages [illegible]. Students must consult the departmental advisor regarding courses to be taken in [illegible] the requirement for meaningful initiation into the humanities and the natural and mathematical sciences.
2. Prerequisite course—Soc 1.
3. Required courses in related areas—12 semester hours in one of the following related social science fields: anthropology, economic geography, history, political science, or psychology.
4. Required courses in the major—Soc 101, 140 or 141, 180; general statistics additional upper division hours in social-group relations courses, crime, deviance, and justice; Soc 155, 156, 157, 159, and one additional course in social and current public policy; Soc 120, 125, 128, 161, and one additional sociology course in sociology.

Master of Arts in the field of sociology—Prerequisite, a bachelor's degree with a major in sociology or in an approved related field. Applicants should present scores on the Graduate Record Examinations, especially in the Verbal and the Quantitative. Plans and arrangements to write letters of reference to the Graduate School of Arts and Sciences.

Required: the general requirements [illegible]. With the approval of the advisor and of the Graduate Education Committee, students may elect one of the following programs: (1) at least 24 semester hours of graduate work plus a thesis (equivalent to six semester hours); satisfactory completion of a Master's Comprehensive Examination in sociological theory and social research methods; and an oral defense of the thesis proposal; or (2) at least 33 semester hours of graduate course work and satisfactory completion of a Master's Comprehensive Examination in sociological theory, social research methods, and one substantive special field (deviant behavior, political sociology, sociology of work, urban sociology, or sociology and social policy). Fifteen semester hours of graduate courses must be interrelated in a logical way to form a subspecialization and may be taken outside of the department.

In addition to the hours specified above, all candidates must satisfactorily complete Stat 105 or its equivalent. All candidates must select from the graduate sociology courses as follows: six hours chosen from sociological theory [illegible] Soc 240 and 250 recommended], six hours chosen from social research methods [Soc 260 and 261 are recommended], and six hours chosen from one special area (deviant behavior, political sociology, sociology of work, urban sociology, or sociology and social policy). Candidates must also fulfill the [illegible] requirement by passing a reading knowledge examination in one foreign language, by satisfactorily completing the quantitative tool options, or by satisfactorily completing the graduate course work option.

Doctor of Philosophy in the field of sociology—Required: the general requirements, pages [illegible] and 57-59. Students must complete [illegible]

semester hours of graduate course work, and from 12 to 16 semester hours of dissertation research for a total of 48 hours beyond the master's degree. Students must indicate in their program of study graduate course work in each of the following: six semester hours of sociological theory including Soc 333; six hours of social research methods and six hours each in two substantive specialties, at least one of which must be chosen from among those offered by the Department of Sociology—deviant behavior, political sociology, sociology of work, sociology and social policy, and urban sociology. Students must satisfactorily complete the General Examination in sociological theory, social research methods, and two substantive specialties. Students must also fulfill the tool requirement by taking any two of the following options: a reading knowledge examination in one foreign language; the quantitative tool option; the graduate course work option.

Departmental prerequisite: Soc 1 is prerequisite to all courses in Sociology except for Soc 181 and 191.

First Group

1 Introductory Sociology (3) — **Staff**

General principles of sociology; development of culture and personality; impact of groups and institutions on man's social behavior. (Fall and spring)

2 Major Social Issues (1, 2, or 3) — **Staff**

Critical examination of three selected social issues in a modular format. Each unit will be offered in a module of about six weeks. Students may register for one, two, or three modules, for a corresponding number of credits. Issues change each semester.

Second Group

101 Development of Social Thought (3) — Lengermann, Stephens

An exploration of the emergence and growth of sociology from 1600 to 1900, with emphasis on the elaboration of sociological concepts and theories. (Fall and spring)

120 Sociology and Public Policy (3) — Helmer

Introduction to concepts, theory, and research illustrating the application of the sociological perspective to public policy. (Fall)

122 Cases in Policy Analysis (3) — Helmer

Sociological analysis of typical cases in public policy (e.g. education, health, energy, welfare). (Spring)

124 Medical Sociology (3) — Stewart, Brown

Social factors and processes related to the etiology and treatment of physical and mental illness; medical occupations and professions; medical organizations; problems of delivery of health care services. (Fall)

125 Sociology of Religion (3) — Wallace, Yeide

An analysis of the relationship between religion and society. Topics include the emergence of uniquely American religious forms such as civil religion and cultic groups. (Fall, odd years)

126 **Urban Sociology** (3) Helmer
The sociological dynamics of the city and of urban growth in the United States; urban conflict, class conflict, and racial problems; urban society, crime and deviance, political competition, and reform. (Fall)

127 **Population Problems** (3) Stewart
Composition of populations, trends in population growth and population pressure, factors producing population movements, effects of migration, population policies, fertility and birth control. (Fall)

128 **Comparative Urban Sociology** (3) Helmer
(Formerly Urban Problems and Policies)
Processes of urbanization outside the United States; contrasts between western and nonwestern approaches to urban development; urban movements in the Third World and their problems. Prerequisite: Soc 126 or permission of the instructor. (Spring)

129 **Race and Minority Groups** (3) Tropea
Analysis of relationships between dominant and minority groups in society, particularly in the United States; nature and causes of problems; analysis of the phenomenon of prejudice. (Spring)

130 **Class, Status, and Power** (3) Stephens
Analysis of distribution of resources and opportunities for participation; education and social mobility in American society; social welfare programs; analysis of public policies which affect these distributions. (Fall)

131 **Sociology of Education** (3) Wallace, Tropea
Analysis of educational systems from interactionist perspectives; as agencies of socialization; assumptions of educators in modern society, including technological, communal, and subcultural components. (Spring)

135 **Youth and Delinquency** (3) Courtless, Tropea
Analysis of historical, economic, and social conditions giving rise to activities in modern youth and the evolution of the state's systems of control. (Spring)

136 **Criminology** (3) Courtless, Tropea
Nature and distribution of crime and crime rates; the development and operation of criminal law and various social and legal responses in urban society. (Fall)

137 **Sociology of Law** (3) Courtless
Law as a social phenomenon and agency of social control. Special emphasis is placed on the nature of and conditions for the legitimacy of law. (Fall)

139 **Deviance and Control** (3) Tropea
(Formerly Society and the Deviant)
Analysis of the development of deviance through processes of socialization; analysis of the process of societal reaction through cultural definitions and responses; effects of deviance; historical, political, and social contexts. (Spring)

140–41 **Social Research Methods** (3–3) Boeckmann, Cox
Soc 140: introduction to basic research methods in sociology;

141: advanced research methods. Prerequisite to Soc 141: Soc 140. (Soc 140 and 141—fall and spring)

143 Social Movements (3) **Stephens**

General survey of the various forms of collective behavior (fads, panics, riots, social movements, etc.), and a more detailed study of the genesis, development and decay of social movements and social revolutions. (Spring)

149 Modern Sociological Theory (3) **Wallace, Lengermann**

Systematic study of contemporary schools of sociological theory, both European and American; evaluation of scientific contributions of each school. Prerequisite: Soc 101. (Fall and spring)

151 Problems of Urban Social Systems (9) **Staff**

Developing a comprehensive perspective on selected social problems through lectures and readings. Topic changes each semester. Prerequisite: 24 semester hours selected from economics, history, political science, psychology, and sociology. Admission by permission of instructor. Concurrent registration in Soc 152 required. (Fall)

152 Problems of Urban Social Systems—Supervised Field Work (6) **Staff**

Accompanies Soc 151. A maximum of 24 hours a week will be spent in service research efforts by placement in the Washington, D.C., area. Concurrent registration in Soc 151 required. (Fall)

***153 Poverty in America (3)** **Boeckmann, Yezer**

Exploration of social and economic causes of poverty in the United States and evaluation of anti-poverty strategies, including comprehensive welfare reform. Discussion of conflicts between sociological and economic models of behavior of low income groups.

155 Women, Sex Roles, and Socialization (3) **Wallace**

Analysis of the social-structural and personality theories and empirical research on sex role socialization in contemporary society. Topics include sexual inequality, women's changing place in the occupational structure, and social change and the women's movement. (Fall)

160 Death and Dying: A Sociological Perspective (3) **Staff**

Processes of death and dying examined from cross-cultural and national perspectives. Topics include considerations of terminal care, abortion, murder, funeral customs, genocide, and the depiction of death in literature and philosophy. (Spring)

181 Major Social Processes (3) **Staff**

Analysis and examination of various processes in society of general importance to the field of sociology, e.g. social conflict, socialization, social change, etc. Topic changes each semester; may be repeated for credit. Admission by permission of instructor. (Fall and spring)

191 Current Emphases in Sociology (3) **Staff**

Analysis and evaluation of recent developments in the general field of sociology. Topic changes each semester; may be repeated for credit. Admission by permission of instructor. (Fall and spring)

*Interdepartmental course offered by the Departments of Sociology and Economics.

195 **Research** (1, 2, or 3) Staff

Independent study and special projects. Open only to selected graduate students with promising research records. Before students are permitted to register for this, they must submit a written proposal of their plan of study for the approval of the staff member of the department who will be directing their research. (Fall and spring)

Third Group

203 **Social Organization** (3) Wallace, Brown

Introduction to sociological concepts and perspectives on society as a system of institutions. Recommended for students offering sociology as a separate unit. (Fall)

210 **Theoretical Foundations of Political Sociology** (3) Lengermann

Sociological theory on the relationship of politics to the wider social system. Emphasis on concepts of power, alienation, theories of political stability, conflict and change. (Fall)

212 **Seminar: Political Processes** (3) Lengermann, Boeckmann

Sociological analysis of political process in the United States. Distributions of power: political socialization, attitudes, participation, communities, social movements. Prerequisite: Soc 210. Spring

220 **Religious Institutions in Urban America** (3) Wallace, Yeide

Historical trends of religious institutions and patterns of interaction between religious and secular institutions in contemporary urban life. (Spring, even years)

223 **Urban Sociology** (3) Heiges

Sociological perspectives on urbanization and urbanism with emphasis on assessments of the logic and limitations of theory.

224 **Urban Life** (3) Heiges

Examination of urban differentiation, social, cultural, ecological life styles, formation, properties, processes, participation. Soc 223. (Spring)

230 **Sociological Research Methods** (3) Boeckmann, Cisin

Historical survey of sociological research. Analysis and critique of the literature in each area. Recommended for students who plan to undertake graduate research. Prerequisite: Soc 101 or equivalent. (Fall)

231 **Seminar: Advanced Research Methods** (3) Boeckmann, Cisin

Intensive investigation of a few selected research areas. Prerequisite: Soc 230 or equivalent. (Spring)

232 **Seminar: Research Planning and Execution** (3) Cisin, Boeckmann

Critical review of student research projects, recommended for graduate students engaged in thesis and dissertation research. Prerequisite: Soc 230 or equivalent. (Spring)

235 **Seminar: Sociology of Education** (3) Wallace

Sociological theories on relationships between education and

economic, political, social, and cultural character of society; examination of social factors relating to such topics as educational achievement, the changing functions of educational structures, and the roles of teacher and student. (Spring, odd years)

238 **Seminar: Development of Sociological Theory** (3) Lengermann
Development of sociology from the early 1800s to the 1920s. Intensive analysis of the classical theoretical statements. (Fall)

239 **Seminar: Modern Sociological Theory** (3) Lengermann, Wallace
Intensive examination and evaluation of contemporary schools of sociological theory in Europe and America. Advanced analysis of theoretical perspectives. Prerequisite: Soc 238. (Spring)

240 **Sociology of Work and Occupations** (3) Stewart
Analysis of occupational roles and structures: recruitment and training; adjustment problems at various career stages; interrelationships of stratification, life styles, and work roles. (Fall)

241 **Sociology of Work and Organizations** (3) Stewart
Theory of complex organizations applied to such institutions as government, management, and business; examination of basic processes such as decision-making, recruitment, allocation of authority, informal organization, and interprofessional relations. (Spring)

242 **Seminar: Medical Sociology** (3) Stewart, Brown
(Formerly Seminar: Urban Medical Systems)
Sociological analysis of cultural, social, and psychological factors in occurrence and care of physical and mental illness as they structure in the community, the hospital, and in interpersonal relations; study of the social structure of health care systems and interplay of the various health professions. (Spring)

252 **Seminar: Sociology and Social Policy** (3) Helmer, Boeckmann
Concepts, theory, and research which demonstrate the applicability of a sociological perspective (the concepts, theory of social systems, social control, organization, power, stratification, deviance, norms, values) to the policy process. (Fall)

*254 **Seminar: Methods in Social Policy Research** (3) Boeckmann, Helmer
Systematic survey of conceptualization, design, and practice of evaluation research in social programs, and of simulation and modeling of social processes. Prerequisite: Soc 200, Soc 250, or permission of instructor. (Spring)

†259 **Law and Criminology I: Search for the Causes of Criminal Behavior** (3) Courtless, Tropea
Same as Law 475(2). (Fall)

†261 **Law and Criminology II: Society's Responses to the Criminal Offender** (3) Courtless, Tropea
Same as Law 476(2). (Spring)

* Offered jointly by the Educational Policy and Sociology Departments.
† Students registering for Soc 259 or 261 make special arrangements with the instructor for supplementary [illegible] in the additional common hour, for examples of the [illegible] National Law [illegible]

262 **Seminar: Police and the Community** (3) Courtless, Tropea

Analysis of contemporary urban law enforcement including police 'styles,' civil disorder, police-community relations, and comparative perspectives on the place of police agencies in civil society. (Fall)

263 **Seminar: Law and Society** (3) Courtless

Selected problems in law as an instrument of social policy; emphasis on the organization of legal decision-making processes. (Summer)

265 **Seminar: Criminal and Juvenile Justice Systems** (3) Courtless, Tropea

Development of a systematic perspective on components and relationships constituting the juvenile and criminal justice systems. (Spring, even years)

*290 **Principles of Demography** (3) Staff

Introduction to basic demographic perspectives and data; methods for analysis of population size, distribution, and composition; determinants and consequences of population trends. (Fall)

*291 **Methods of Demographic Analysis** (3) Staff

Basic methods for analysis of mortality, natality, and migration; population estimates and projections; estimation of demographic measures from incomplete data. (Spring)

295 **Research** (arr.) Staff

Independent study and special projects. Before permission is granted to register for Soc 295 the student must submit a written plan of study for the approval of the staff member of the department who will be directing the research. May be repeated once for credit. (Fall and spring)

299–300 **Thesis Research** (3–3) Staff

(Fall and spring)

Fourth Group

333 **Seminar: Theory Construction and Application** (3) Tropea

Critical examination of the elements of current theories in the social sciences with the major objective of developing general principles of theory construction; consideration of the functions of theory in sociological research. (Fall)

351 **Selected Topics in Sociology** (3) Staff

Intensive investigation of special topics in sociology. May be repeated for credit. The following topics will be offered as desired: topics each fall semester: (1) *Social Research*—current interests in social research, evaluation research, philosophy of science; (2) *Political Sociology*—comparative political structures, processes of policy formation, social movements, etc.; (3) *Sociology of Work*—work and public bureaucracies, industrial sociology, etc.

352 **Selected Topics in Sociology** (3) Staff

Intensive investigation of special topics in sociology. May be repeated for credit. The following topics will be offered as staff

* Interdepartmental course offered by the Departments of Economics, Geography, Regional Science, Sociology, and Statistics

[illegible] each [illegible] [illegible] Theory—study of important theorists such as Marx, Weber, Parsons; important themes such as social change, social control; important schools such as symbolic interactionism, general systems theory. [2] Urban Social Life—ecological processes, sub-communities, the urban school, race and ethnic relations and related topics. [3] Law and Society—the sociology of law, theories of deviance, and related topics.

398 **Advanced Reading and Research** (arr.) Staff
Limited to graduate students preparing for the Master of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

SPANISH

See **Romance Languages and Literatures.**

SPECIAL EDUCATION

Professors P. Botwin, R.S. Cottrell, Jr., R.K. Ives *(Acting Chairman)*
Associate Professor J.R. Shotel
Assistant Professors M.S. Castleberry, L.A. Teantis, N.D. Tiusanen, N.J. Sobel, R. Ianacone, A.J. Mazur *(Research)*
Assistant Professional Lecturer H. Novosielski
Instructor M.B. Freund *(Research)*
Lecturers W.H. Eddy, J.L. Boyle

Programs of study in special education leading to the degrees of Bachelor of Arts in Education, Master of Arts in Education, and Doctor of Education are [illegible] by the School of Education and Human Development (see pages [illegible])

Second Group

101 **Seminar: Dimensions of the Complementary Teaching Role** (3) Mazur
Instructional experiences designed to refine the insights and competencies essential for successful operation in the complementary teaching model. (Fall)

102 **Teaching the Child with Special Needs: Methods and Materials** (3) Mazur
Laboratory course taught in an elementary public school. Students observe and participate in a demonstration seminar conducted by the instructor. Must be taken concurrently with SpEd 189. (Fall)

103 **Teaching the Child with Special Needs: Creative Programming** (3) Mazur
Continuation of SpEd 102. Concentration on the total programming of the child with special needs. Must be taken concurrently with SpEd 190. (Spring)

170 **Interpersonal/Intrapersonal Relationships for Special Education Teachers** (3) Mazur

Consideration of factors leading to successful interaction with children. (Fall)

189 **Preprofessional Practicum: Observing the Special Child in the Regular Class Milieu** (3) Staff

Supervised internship in school setting. Emphasis on intensive study of children with special needs. Must be taken concurrently with SpEd 102. (Fall)

190 **Preprofessional Practicum: Inspecting a Continuum of Special Education Services** (3) Staff

Observation and participation in various special education settings. Emphasis on exposure to and familiarity with goals and programs of various special education models. Must be taken concurrently with SpEd 103. (Spring)

197–98 **Special Study in Special Education** (3–3) Staff

Individual or group study or research under the guidance of staff members. Program and conferences arranged with advisor. Admission by permission of advisor. [Academic year]

199 **Practicum in Complementary Teaching** (6) Mazur

Supervised teaching internship in a school-based intervention program. Student teaching with children identified as needing special education services. A minimum of 240 clock hours required. Admission by permission of the instructor. (Spring)

200 **Psychosocial Development of Young Exceptional Children** (3) Tiscione

A course designed to illuminate the complex and interactive processes with exist in the relationship between psychosocial development and the development process in general. [Fall, alternate years]

Third Group

201 **Introduction to Special Education** (3) Botwin

Survey course to acquaint prospective teachers with special populations and to help them become aware of the various educational modifications necessary to accommodate children in a school program. (Fall)

230 **Vocational/Special Education Assessment of the Secondary Level Handicapped Student** (6) Ianacone

Individual study of methods and materials used in vocational assessment including formal and informal tools to determine special interests and aptitudes, academic performance, learning style and behavioral readiness. (Fall)

231 **Selected Vocational/Special Education Methods and Materials** (3) Staff

Selected methods and techniques used in teaching and programming for the secondary school level handicapped person in academic, career, leisure, and occupational skill areas. (Fall)

232 **Practicum: Vocational/Special Education** (3) Ianacone

Placement in at least three to five different sites offering p

in the area of pre-vocational, industrial arts, and vocational programming that serve the adolescent student. (Fall)

233 **Curriculum for Vocational/Special Education** (3) Staff
Strategies and practices in designing and implementing academic self-help, career education, pre-vocational, industrial arts, and vocational curriculum skills for the handicapped. (Fall)

234 **Seminar in Vocational/Special Education** (3) Janes
Weekly seminar dealing with experiences, problems and concerns encountered during the internship with handicapped adolescents. Must be taken concurrently with Special Education 232. (Spring)

235 **Coordination of Job Placement Programs in Vocational/Special Education** (3) Staff
Issues and practices for the development and coordination of an adolescent job placement program. (Spring)

236 **Secondary Career Planning for the Handicapped** (3) Eddy
This course will address the pressing concerns of career decision making by the handicapped person who is considering a secondary school level program. (Summer)

260 **Developmental Assessment of Young Exceptional Children** (3) Sanch, Tsantis, Tsiouris
Lecture, demonstrations, and clinical practice in formal and informal assessment procedures. Admission by permission of instructor. (Fall)

261 **Practicum: Methods and Materials for Young Exceptional Children** (7) Ivey, Tsantis, Castleberry, Shurtz, Sobel
Clinical practice in design and modification of educational programs and materials. Time distribution: designing and developing teaching materials, classroom teaching, seminars and independent work. Students taught in a demonstration unit. Minimum eight hours a week in session. (Fall)

262 **Seminar: the Education of Young Exceptional Children** (3) Sobel, Tsantis, Tsiouris, and Staff
Weekly seminar dealing with experiences, problems and concerns encountered during the internship in the education of young exceptional children. Must be taken concurrently with 261. Admission by permission of instructor. (Spring)

263 **The Severely and Profoundly Handicapped Child: Development and Etiology** (3) Freund and Staff
Survey of the characteristics and learning patterns of children with severe disabilities. Lecture and field experiences. (Fall)

264 **The Severely and Profoundly Handicapped Child: Methods and Techniques** (3) Staff
Specialized programs, techniques, and methods for teaching children with severe disabilities. (Spring, even years)

265 **Clinical Experience with Multiply Handicapped and Developmentally Disabled Young Children** (3) Ivey and Staff
Preliminary field experience designed for students with no experience in early childhood special education. Supervised experience

necessary for program articulation. [illegible] week intensive involvement [illegible] skills in special education. [illegible]

[illegible] The Development of Language in Young Exceptional Children (3) [illegible]
[illegible] introduction to the study of language acquisition and the application of current research on language of handicapped children. [illegible]

[illegible] The Early Childhood Special Educator: A Survey of Roles and Services (3) [illegible] Tsantis, Freund, Sh[illegible]
[illegible] examination of the expertise [illegible] available in early childhood special education programs for their expectations and performance dynamics in the special setting. [illegible]

[illegible] The Development of Young Exceptional Children with Emphasis on Handicapping Conditions (3) Sobel, Freund
Lecture (2 hours), site visitation (3 hours), discussion (1 hour). (Fall)

[illegible] Multidisciplinary Theory in Special Education (3) Ives, Castleberry, Sobel, Tiscione
Seminar involving student presentations focusing on sociological and psychological constructs relevant to interpersonal interpersonal relationships. (Fall)

[illegible] Mainstreaming: Adapting Programs and Curriculum to Meet the Needs of the Special Child (3) Staff
Review of the basic curriculum areas as they relate to the development of readiness skills in special education. (Spring, alternate years)

[illegible] The Interdisciplinary Approach to Planning for the Handicapped Child (3) Freund
Laboratory experience in which students participate as members of an interdisciplinary team. (Fall)

273 Seminar for Special Education Strategist Intern (3 or 6) Ives, Castleberry, Sobel
Weekly seminar dealing with experiences, problems, and concerns encountered during special administrative internship. Discussion of leadership. Consideration of current issues in SpEd are explored. (Spring)

290 Control and Management Techniques for the Young Exceptional Child (3) Tiscione, Sobel
Examination of the theory, techniques, and tools essential for [illegible] control. Designed to provide practice as well as familiarity with various theories of control of human behavior. Admission by permission of instructor. (Fall)

292 Professional Internship in Education of Young Exceptional Children (6 or 9) Sobel, Tsantis, Tiscione, and Staff
Supervised internship in the education of young exceptional children. A minimum of 420 clock hours required. Must be taken concurrently with SpEd 262. (Spring and summer)

293 Professional Internship for the Special Education/Early Childhood Strategist (9) Ives, Castleberry, Sobel
Supervised internship in strategist role, emphasizing di[illegible]

multidimensional aspects of a special education/early childhood program. A minimum of 420 clock hours is required. Concurrent enrollment in SpEd 273 required. (Spring)

295 **Professional Internship in Vocational/Special Education** (9) — Iannone and Staff

Supervised internship in the vocational/special education of adolescent handicapped youth, emphasizing the disabilities, socio-functional, and inter-agency competency needs for skill programming. A minimum of 450 clock hours is required. Must be taken concurrently with SpEd 234. (Spring)

297–98 **Individual Study in Special Education** (3–3) — Staff

Individual study or research under guidance of staff member. Program and conferences arranged with advisor. Admission by permission of advisor. (Academic year)

306 **Dynamics of Family Intervention: Theory and Practice in Special Education** (3) — Ives, Castaldi-Cerny, Tsantis, Sobal

Theoretical formulations and clinical techniques necessary for the early childhood special educator to successfully counsel parents of handicapped children. (Spring)

350 **Child Identification and Assessment: The Process of Planning Appropriate Educational Intervention** (3) — Staff

Exposes administrative experiences in information relative to the exceptional child. Examines etiologies and symptomatologies of handicapping conditions, developmental norms, identification and assessment strategies and individualized educational programming.

351 **Seminar: Developing School/Community Support Systems– Models for Effective Service Delivery** (3) — Staff

Provides experiences that facilitate effective service planning for the handicapped child through the examination of existing models of family intervention, curriculum adjustment, and special education service delivery.

352 **Seminar: Legal Issues and Public Policy Concerns in Planning Service Access for the Special Child** (3) — Staff

Allows administrators/supervisors to review the responsibilities of their existing roles with regard to requirements generated by the legislative and judicial branches of the government.

360 **Advanced Techniques in the Diagnostic-Assessment Process** (3) — Tisdone

Application of theoretical concepts of assessment: development of assessment programs, interpretation and application of interdisciplinary diagnostic evaluations. Prerequisite: SpEd 260 or equivalent. (Summer)

370 **Interpersonal Dynamics in Special Education: Attitude Change and the Access Process for the Special Child** (3) — Staff

Applies specific psycho-educational constructs germane to successful human interaction to the school administration as interfaced with the public school system and the specific agencies responsible for servicing the special child.

Fourth Group

401 **Doctoral Mini-Seminar in Special Education** (1) Staff

Participation in a small group with a selected faculty member in intensive study and discussion of an area of common interest in an informal environment providing for the exchange of ideas and optimum potential for personal and professional growth. Admission by permission of instructor. (Fall)

473–74 **Doctoral Internship: Special Education** (6–6) Staff

Supervised professional internship in college teaching, administration, supervision, or private agency practice. Each internship individually arranged. Admission by permission of advisor. Academic year)

490 **Departmental Seminar in Special Education** (3) Shotel

Provides an opportunity for selected graduate students to develop, refine, and demonstrate their skills and abilities in a small-group setting with fellow students and department faculty. Admission by permission of instructor. (Spring)

491 **Dissertation Research** (arr.) Staff

Fifth Group

701 **Experimental Course** (3) Staff

721 **Experimental Course—Interdepartmental** (3) Staff

SPEECH AND DRAMA

Professors J.W. Hillis *(Director of Speech Pathology and Audiology)*, L.S. Bowling *(Chairman)*, W.M. Reynolds *(Director of Speech Communication)*, L.S. Bielski

Professorial Lecturer G. Herer*

Associate Professors M.D.M. Brewer, J.R. Reginell, C.W. Linebaugh

Adjunct Associate Professor M.S. Kernan

Associate Professorial Lecturers N. Striffler, S. Willig

Adjunct Professors N.C. Garner *(Director of Theater)*, S. Keller *(Director of Forensics)*, B.W. Sabelli, J.E. Thiel, A.G. Wade, L.B. Jacobson

Instructor T.A. Farrand

Bachelor of Arts with a major in dramatic art (departmental)—The following requirements must be fulfilled:

1. The general requirements as stated on pages 72-73, 74-85. [Students should consult the departmental adviser regarding courses to be taken in satisfying the requirement for meaningful interests in the social sciences and the natural and mathematical sciences.]

2. **Prerequisite courses—SpDr 1, 11.**

3. Required courses in related areas—24 semester hours of second-group courses outside the Department of Speech and Drama as approved by the major adviser. [Courses in dramatic literature offered in the classics, English, and foreign language departments are strongly recommended.]

4. **Required courses in the major—SpDr 114 or 115, 151, 152** or 195, 196—be-9 additional semester hours in second-group drama courses.

* Gilbert Mitchell Herer is also Professor of Child Health and Development in the George Washington University School of Medicine and Health Sciences

Bachelor of Arts with a major in radio-television (experimental)—The following requirements must be fulfilled:

1. The general requirements as stated on pages 73–75 and 79–85. [Students should consult the departmental advisor regarding courses to be taken in satisfying the requirements for meaningful initiation into the social sciences and the natural and mathematical sciences.]
2. Prerequisite courses—SpDr 1, 11
3. Required courses in related areas—18 semester hours in a single subject area outside the Speech and Drama Department as approved by the major advisor.
4. Required courses in the major—SpDr 32 or 40, 75, 183, 185, 188, and 189. Twelve hours of second group courses chosen from the areas of radio-television and film studies, and/or from speech communication, drama and speech pathology-audiology as approved by the major advisor.

Bachelor of Arts with a major in speech communication (departmental)—The following requirements must be fulfilled:

1. The general requirements as stated on pages 72–75, 79–85. [Students should consult the departmental advisor regarding courses to be taken in satisfying the requirement for meaningful initiation into the social sciences and the natural and mathematical sciences.]
2. Prerequisite courses—SpDr 1, 11.
3. Required courses in related areas—12 semester hours in psychology and/or philosophy as approved by the major advisor; 18 semester hours in a single subject area outside the Department of Speech and Drama as approved by the major advisor.
4. Required courses in the major—SpDr 112, 121, 126; 15 additional semester hours of second-group courses in the Department of Speech and Drama as approved by the major advisor.

Bachelor of Arts with a non-professional major in speech pathology and audiology (departmental)—The following requirements must be fulfilled:

1. The general requirements as stated on pages 72–75, 79–85. [Students should consult the departmental advisor regarding courses to be taken in satisfying the requirements for meaningful initiation into the social sciences and the natural and mathematical sciences.]
2. Prerequisite courses—SpDr 1, 11.
3. Required courses in related areas—Psyc 115, 121 and 181 for their equivalent, plus 15 additional semester hours of second group courses selected from related areas as approved by the major advisor.
4. Required courses in the major—SpDr 103, 104, 106, 126, 149, an additional semester hours of courses in the Department of Speech and Drama as approved by the major advisor.

Master of Arts in the field of speech pathology and audiology—Prerequisite: the degree of Bachelor of Arts with a major in speech pathology and audiology from this University, or an equivalent degree, and an appropriate score on the Aptitude Test of the Graduate Record Examinations.

Required: the general requirements, pages 86–88. The program of study consists of 36 semester hours of approved course work without a thesis, or work, with the approval of the department, 24 semester hours of approved course work plus a thesis (equivalent to six semester hours). All students must satisfy the academic and supervised practicum requirements of the Certificate of Clinical Competence awarded by the American Speech and Hearing Association.

All students must take the National Examination in Audiology or in Speech Pathology, available through the Educational Testing Service. Students must request the Testing Service to send copies of the test scores to the department of speech and drama to be used in the fulfillment of the general requirement of the Graduate School of Arts and Sciences for the Master's Comprehensive

[illegible] weeks before graduation.

Master of Fine Arts in the field of dramatic arts—Prerequisite: the degree of Bachelor of Arts from this University, or an equivalent degree.

Required: the general requirements, pages 46–48. The program of study consists of 51 to 60 semester hours of second- and third-group course work planned in consultation with the advisor: (2) a creative thesis (equivalent to six additional semester hours) in the selected area of concentration. The candidate is expected to complete the program in residence in four continuous academic-year semesters.

Bachelor of Arts in Education with a teaching field in speech and drama—Prerequisite: the education curriculum, pages 111–12.

Required: the speech and drama option and the professional courses listed on page 116.

Speech and Hearing Therapy: See Speech and Hearing Clinic, page 51.

First Group

1 Communicative Speaking and Listening (3) Reynolds and Staff

Basic theories and principles of public speaking; research, composition, delivery, and criticism. Recording fee $5. (Fall and spring)

2 Interpersonal Communication (3) Reynolds

Introduction to the role of verbal and nonverbal transactions in [illegible] encounters. Role playing, models, and simulations. (Summer)

11 Voice and Diction (3) Bielski and Wade

Development of naturalness, correctness, and clarity in communication through the study of phonetics, rate, volume, pitch, and quality in preparation for performance. Recording fee $5. (Fall and spring)

32 Interpretation (3) Wade

The study of literature through performance. Interpretation of prose, poetry, and drama. (Fall and spring)

45 Understanding the Theater (3) Staff

The art of the theater: its literature, aesthetics, and mechanics. Contributions of the playwright, actor, director, and designer examined through lectures and class discussion. Attendance at theatrical performances and presentations by visiting artists. Primarily for non-majors. (Fall and spring)

49 Rhetoric in Political and Social Action (3) Keller

Study of the use and abuse of rhetoric in contemporary political and social movements. Theories of persuasion and agitation, as well as means of support considered in various case studies including civil rights, anti-Vietnam protests, and women's rights. (Fall)

75 Sight and Sound (3)

Development of a critical awareness of auditory and visual communication through an introduction to the techniques and aesthetics of audio-visual media. Prerequisite: permission of instructor. Laboratory fee, $10. (Fall and spring)



Second Group

101 Bioacoustics (3) Brewer

Acoustic analysis of speech and the physiology of reception and processing of speech by the human auditory system. Prerequisite: HiSc 3–4 or 11–12 or equivalent; Psyc 1 or 5 or 6 or equivalent. (Fall)

103 Biophonetics (3) Linebaugh

Biological basis of speech production. Emphasis on the function of the nervous system, the respiratory system, and the vocal and articulatory mechanisms in the production of intelligible speech. Prerequisite: HiSc 3-4 or 11-12 or equivalent; Psyc 1 or 5 or 6 or equivalent. (Fall)

104 Introduction to Speech Pathology (3) Regnell

Survey of the field of speech pathology. The effect of body-system pathologies and environmental factors on the production of speech and language. Prerequisite: SpDr 103. (Spring)

105–6 The Writing of Plays (3–3) Claeyssens

Same as Engl 105–6. Prerequisite: Engl 9 or 10; 11 or 12; consent of instructor. The student should submit a writing sample to the instructor before registration.

108 Introduction to Audiology (3) Brewer

Survey of the field of audiology. The effect of body-system pathologies on the reception of speech and other acoustic stimuli. Procedures of pure-tone and speech audiometry. Clinical and educational services for the hearing impaired. Prerequisite: SpDr 101. (Spring)

111 Business and Professional Speaking (3) Reynolds

Study of the communication process in business and professional speaking; practice in presenting technical reports; selling policies, programs, and services; conference leadership; speech writing and supervisory activities. Primarily for nonmajors. (Fall)

112 Persuasion (3) Keller

In-depth study of the principles and techniques of persuasion focusing on theory and practice. Emphasis is placed on the common-premise model while considering factors of image, support materials, emotion, audience analysis, and style. Prerequisite: SpDr 1 or permission of instructor. (Spring)

113 Voice for the Theater (3) Jacobson

The practice and application of voice production in four areas: skeletal alignment, breathing, resonance, and articulation. Emphasis is placed on individual experiment in the process of voice production and its application to dramatic texts. Prerequisite: SpDr 11 and permission of instructor. (Fall)

114 Introduction to Acting (3) Jacobson

For non-dramatic art majors. Introduction to the principles of acting for stage and television. Practice in scene work and on-camera performance. (Fall, even years; spring, odd years)

115 Acting I (3) Garner

Basic techniques of concentration, imagination, and character analysis. Concurrent registration in HKLS 115 required. Admission by permission of instructor. (Fall)

116 **Acting II** (3) Garner

Principles of role development. Stress on [illegible] century realism. Concurrent registration in [illegible] required. Admission by audition. Prerequisite: SpDr 115. (Spring)

117 **Audition Techniques** (1)

The course examines all aspects of the audition process: selection and rehearsal of audition monologues, handling of cold reading, etc. Prerequisite: SpDr 115 or the equivalent. (Spring, odd years)

118 **Structural Analysis of Speech and Language** (3) Striffler

Development of skills in the phonetic/phonemic transcription and systematic analysis of oral language samples. Prerequisite: PsyC 131 or equivalent. (Spring)

119 **Clinical Procedures for Communication Disorders** (3) Hills

Development of skill in precision treatment techniques for communicative disorders. Emphasis on accountability of procedures in clinical and educational settings for the communicatively handicapped. Prerequisite: PsyC 121 and 131 or equivalent and permission of instructor. (Fall)

121 **Group Discussion and Conference Leadership** (1 or 2) Reynolds
(Formerly 3 credits)

Process of thinking and problem-solving in committees and small groups; methods of leading discussions and conferences. Prerequisite: SpDr 1 or permission of instructor. (Fall and spring)

126 **Argumentation and Debate** (3) Reynolds

Study of the advocacy system; special emphasis on issue identification, use of evidence, and logical proof. Extensive practice in argumentative speaking. Prerequisite: SpDr 1 or permission of instructor. (Spring)

127–28 **Forensic Practice** (1–1) Keller and Wade

Student participation in intercollegiate speech activities. May be repeated for a total of four semester hours of credit. Admission by permission of instructor. (Fall and spring)

132 **Radio-Television Performance** (3)

Introduction to the basic theories and techniques required for effective performance in radio and television (i.e., announcing, acting, newscasting, etc.). Prerequisite: SpDr 1, 11, or 32, and permission of instructor. (Spring)

133 **Broadcasting in America** (3) Farrand

Study of the origins, structure, and nature of American broadcasting. (Fall)

134 **Radio Production** (3) Farrand

Introduction to the basic concepts of radio as a communication medium; emphasis on the design and production techniques of a variety of radio programs. Prerequisite: permission of instructor. Laboratory fee, $10. (Fall and spring)

135–36 **Radio Workshop** (1–1) Farrand

Theory and practice in radio station operations. Admission by permission of instructor, after one semester of satisfactory participation

in WRCW activities. May be repeated for a total of four semester hours of credit. (Academic year)

137 Scriptwriting (3) Theil

Study and practice of the forms, techniques, and types of writing for radio, television, and film. Prerequisite: Engl 11 or 12, and permission of instructor. (Spring, odd years)

138 Scriptwriting: Selected Topics (3) Wade

Intensive study and practice of a specific genre of radio, television, and film writing. Topics may include adapting the literary text, series and serials, and anthology drama. Prerequisite: Engl 11 or 12, and permission of instructor. (Spring, even years)

141 Negotiations and Conflict Resolution (3) Keller

Communications factors involved in negotiation and conflict resolution. Use of models and simulations to explore problem-solution approach to conflict situations. (Summer)

143 Origins of Contemporary Rhetorical Theory (3) Reynolds

Study of rhetorical theory and method as they evolved in the Western world from the classical period to the present. (Fall, even years)

144 History and Criticism of American Public Address (3) Reynolds

Study of American oratory from its pre-Revolutionary origins to the present day, interpreted in terms of issues and movements. (Spring, odd years)

145 Introduction to Television Production (3) Thiel

Basic course in television production techniques and skills. Directing, script-writing, graphics, and other aspects of television production. Extensive practice in working television equipment; emphasis on various in-studio projects. Prerequisite: SpDr 134. Laboratory fee, $10. (Fall)

146 Television Directing (3) Thiel

(Formerly Advanced Television Production)

Advanced study and practice of television directing techniques. Students are expected to demonstrate skill in working with studio and electronic field production equipment and in the development of television programs from original concepts to final productions. Prerequisite: SpDr 145 and permission of instructor. Laboratory fee $10. (Spring)

147 Innovations in Television Communication (3) Farrand

Utilization of television technology for non-broadcast purposes (i.e., corporate, medical, legal, therapeutic, artistic, and educational). Prerequisite: SpDr 133 and 145. (Fall, odd years)

148 Television Production (3) Farrand

Advanced production techniques with emphasis on the creative and executive aspects of the producer's role. Prerequisite: SpDr 146 and permission of instructor. Laboratory fee, $10. (Fall)

149 Communicative Effects of Broadcast Programming (3) Thiel

Theories and research pertaining to issues, controversies, and problems of cultural conditioning in American broadcast programming. Prerequisite: SpDr 133. (Spring, even years)

151 Stagecraft (3) Sabelli

Lecture (2 hours), laboratory (1 hour). Theories and practicum in construction, rigging, and scene painting. (Fall and spring)

152 Advanced Stagecraft (3) Staff

Lecture (2 hours), laboratory (1 hour). Theories and practicum in the fundamentals of lighting and sound for the theater and television. (Fall and spring)

154 Directing (3) Garner

Fundamentals of script analysis, casting and rehearsal techniques. Prerequisite: permission of instructor. Laboratory fee, $10. (Fall)

155 Properties Design (1) Sabelli

(Formerly Play Production Practice I)

Theory and practicum in construction of stage props and set decoration including [illegible] (Fall, even years)

156 Make-Up Design (1) Sabelli

(Formerly Play Production Practice II)

Theory and practicum in the art of makeup design, including prosthesis, mask making, latex [illegible] (Spring, odd years)

158 Stage Management (1) Sabelli

Fundamental study of stage management with emphasis on practical production work as well as theory. (Fall and spring)

159 Theater Architecture (1) Sabelli

Study of [illegible] principles, theories and styles of theater architecture. (Spring, even years)

163 Musical Theater (6) Sabelli and [illegible]

Growth of American musical theater. Development of all its components: libretto, dance, composition, lyrics and the overall [illegible] production. (Summer)

165–66 History of the Theater (3–3) Jacobson

An examination of the development and growth of the theater from its beginnings to the present. SpDr 165: from the Greek through Restoration. SpDr 166: the 18th century to the present. (Academic year 1979-80 and alternate years)

171 Language of Cinema (3) Kernan

(Formerly Hum [illegible])

Introduction to cinema as language through analysis of the components of film structure—camera, editing, sound, movement, music, dialogue and mise-en-scène. Class work includes reading, visual communication exercises and a final project. Admission by permission of instructor. (Fall)

172 Film Directors and Styles (3) Kernan

(Formerly Hum [illegible])

Examination of influence on major film directors of twentieth-century art movements: German expressionism, Soviet constructivism, surrealism, neo-realism and structuralism. Comparison of film narrative with styles in dramatic and visual art forms. (Fall)

*173 **History of Cinema** (3) Kernan
An examination of motion [illegible] history in terms of socially structured narrative from Griffith to [illegible] (Spring)

174 **Special Studies in Film** (3) Kernan
(Formerly Hum 181)
An intensive study of the structure of [illegible]ified by the work of a [illegible] director or film group. (Fall)

175 **The Political Image** (3) Kernan
An analysis of the techniques of propaganda and rhetoric used in film and television to [illegible] political messages. (Spring, even years)

176 **Film as Fact and Fiction** (3) Kernan
A comparison of structural differences between documentary and fiction film in order to study how each presents different versions of reality. (Spring, odd years)

†192 **The American Cinema** (3) Kernan
History and criticism of American film. The course will enable the student to recognize and evaluate screen techniques, to express the evaluative theory in writing and to understand the role of films in the context of American culture. (Spring)

193 **Scene Design** (3) Sabelli
Fundamental study of scenography, including drafting, rendering and model construction. (Fall)

195 **Costume History and Construction** (3) Staff
History of fashion in Western civilization from ancient Egypt to the present. Study of basic design principles. Laboratory work in costume construction. (Fall)

196 **Independent Study** (1 to 6) Staff
Independent research and special projects open only to undergraduate students in their senior year. Those students are permitted to register for this [illegible] they must submit a written proposal of the plan of study and obtain approval of the staff member who will be directing the study and of the department chairman.

Third Group

Split [illegible] and 213 are for Master of Arts candidates in the field of speech [illegible] and graduate other students may be admitted by permission of the [illegible]

213 **Special Problems in Speech for the Actor** (3) Jacobson
An advanced study of vocal production and interpretation for the actor. The work will focus on stage dialects and the articulation and interpretation of Shakespeare's plays. Prerequisite: SpDr 113. (Spring)

215–16 **Acting: Scene Study** (3–3) Jacobson
Scene work in modern, classic and other unrealistic drama. Admission by audition. Both courses may be repeated once for credit. Recording fee, $4. (Academic year)

* Joint offering of the Art and Speech and Drama Departments.
† Joint offering of the Speech [illegible] and the American Studies Program.

250 **Advanced Scene Design** (3) Sabelli

Preparation for the advanced student designer, with emphasis on the individual development of rendering techniques, technical drafting, traditional script analysis, and original scenographic interpretation. (Fall)

251 **Special Projects in Scene Design** (3) Sabelli

(Formerly Advanced Scene Design)

Exploration of all styles of traditional and contemporary scenography. Admission by permission of instructor. (Spring)

252 **Advanced Costuming** (3) Staff

Study of special design, style, and construction problems. (Spring)

253 **Problems in Costume Design** (3) Staff

The study of pattern drafting and draping methods based on historical costumes through lecture and classwork. Basic millinery construction and design. Prerequisite: SpDr 195. (Spring, even years)

255 **Lighting Design** (3) Sabelli

Theory and execution of lighting design for theater and television. Prerequisite: SpDr 152. (Spring)

256 **Directing Seminar** (3) Garner

Problems in directing plays from selected periods. May be repeated for credit. (Spring)

257 **Modern Trends** (3) Staff

Study of recent developments in dramatic theory, literature, and production. (Fall, even years)

258 **Theater Management** (3) Staff

Theory and practice in theater management, promotion, box office, and house management. Admission by permission of instructor. (Fall, odd years)

261–62 **Theatrical Styles** (3–3) Staff

(Formerly SpDr 161–62)

Detailed study of the culture, climate, and production techniques of significant periods of drama. Prerequisite: SpDr 165–66. (Academic year)

267 **Interdisciplinary Study of Language Disorders** (3–6) Staff

For graduate students in education, speech and hearing and psychology. Psycho-educational team participation, case discussion, and analysis of case studies. Multidisciplinary understanding of philosophies of learning and treatment of symbolic malfunctioning. Admission by permission of instructor. (Fall and spring)

268 **Clinical Practice in Communication Disorders** (1–3) Staff

Supervised clinical practice in the evaluation and treatment of communication disorders. May be repeated for a total of three semester hours of credit. (Fall and spring)

269 **Community Programs in Communication Disorders** (3) Herer

Methods and procedure for the planning, management, and operation of hospital, school and other community programs for the communicatively handicapped. (Fall)

271 **Evaluation of Speech Articulation Disorders** (2) Regnell

Evaluation of persons with speech articulation disorders; staffing of clinical cases; case demonstrations; critical evaluations of speech articulation testing procedures. Laboratory fee, $5. (Fall)

272 **Etiology of Speech Articulation Disorders** (2) Hillis

Biological, linguistic, and psychological bases for disorders of speech articulation; staffing of clinical cases. Laboratory fee, $5. (Spring)

273 **Treatment of Speech Articulation Disorders** (2) Regnell

Treatment procedures to be used with disorders of speech articulation; emphasis on programmed and other objective procedures for the improvement of speech articulation; staffing of clinical cases. Laboratory fee, $5.

274 **Evaluation of Fluency Disorders** (2) Hillis

Theories of the etiology of stuttering and related disorders; procedures for evaluating fluency disorders. Laboratory fee, $5. (Fall)

275 **Treatment of Fluency Disorders** (2) Hillis

Treatment procedures for disorders of speech fluency. Laboratory fee, $5. (Spring)

276 **Fluency Disorders in Children** (2) Hillis

Developmental aspects of stuttering, evaluation and treatment of fluency disorders in children. Laboratory fee, $5.

277 **Clinical Evaluation of Language Disorders** (3) Staff

Evaluation of language disorders in children and adults; case staffings of language problem cases; case demonstrations; and critical evaluations of formal and informal language testing procedures. Laboratory fee, $7.50. (Fall)

278 **Applied Research in Language Disorders** (3) Linebaugh

Current investigations and psycholinguistic research related to language pathologies in children and adults; emphasis on the treatment of aphasia in adults; learning characteristics of objective procedures for charting clinical progress. Laboratory fee, $7.50. (Spring)

279 **Clinical Treatment of Language Disorders in Children** (3) Linebaugh

Current language therapy programs for children and critical evaluation of these programs in light of modern psycholinguistic concepts; emphasis on objective procedures for charting or measuring gains in language therapy for children with various handicapping conditions. Laboratory fee, $7.50. (Summer)

280 **Functional Voice Disorders** (2) Regnell

Review of the normal structure and function of the vocal mechanism; acquisition of knowledge and of clinical/educational skills in providing speech evaluation and treatment for persons with functional voice disorders. Laboratory fee, $5. (Fall)

281 **Alaryngeal Speech** (2) Regnell

Acquisition of knowledge and of clinical/educational skills in providing speech evaluation and treatment for laryngectomized persons. Laboratory fee, $5. (Spring)

282 Organic Voice Disorders (2) **Regnell**

Acquisition of knowledge and of clinical/educational skills in providing speech evaluation and treatment for persons with organic voice disorders; special consideration given to the management of voice disorders in children. Laboratory fee, $5. (Summer)

283 Aural Rehabilitation (3) **Brewer**

Systems, principles, and methods of auditory training and speechreading; related to development of lesson plans and their application in resolving communication problems of acoustically-handicapped individuals. Laboratory fee, $7.50. (Fall)

284 Advanced Clinical Audiology (3) **Bowling**

Principles and methods underlying assessment of auditory disorders; emphasis on bone conduction, masking, and speech intelligibility. Clinical applications, tests, demonstration and practicum. Laboratory fee, $7.50. (Fall)

285 Hearing Aids (3) **Brewer**

Discussion of hearing-aid characteristics and electroacoustic measurements; hearing aid effectiveness in improving communicative efficiency; procedures for selection and clinical evaluation of hearing aids; counseling of the patient. (Spring)

286 Special Auditory Tests (3) **Bowling**

Special speech and pure tone audiometric techniques for differentiating conductive, cochlear, and retrocochlear losses; for identifying functional hearing losses. Clinical application of tests and interpretation of results. Laboratory fee, $7.50. (Fall)

287 Auditory Processing (3) **Bowling**

Detailed study of the factors which affect auditory perception and comprehension; methods and procedures used in identifying disorders of auditory perception and comprehension. Laboratory fee, $7.50. (Spring)

288 Psychosocial Aspects of Hearing Loss (3) **Bowling**

Considerations of the rationale and procedures for evaluating the social and emotional behavior as well as the intellectual potential of those with impaired hearing. Laboratory fee, $7.50. (Spring)

289 Impedance Audiometry and Middle Ear Function (3) **Staff**

Development of skills in impedance audiometry and acoustic reflex assessment of middle ear function. Laboratory fee, $7.50. (Spring)

290 Management of the Hearing-impaired Child (3) **Brewer**

Overall management approach to the hard of hearing child including diagnosis, parent counseling, amplification, educational placement, treatment programs and procedures, and re-evaluation. Laboratory fee, $7.50. (Summer)

292 Language Intervention in the Schools (3) **Staff**

Analysis of language performance problems of school children and development of intervention strategies. For special educators, teachers of hearing-impaired children, remedial reading specialists, multidisciplinary speech pathologists, and teachers of the learning disabled. Professional experience in one of these fields is recommended but not required. (Summer)

294 **Independent Research in Dramatic Art** (arr.) Staff
May be repeated for credit. (Fall and spring)

295 **Independent Research in Speech and Hearing** (arr.) Staff

299–300 **Thesis Research** (3–3) Staff
[Fall and spring]

STATISTICS

Professors H.F. Bright, S. Kullback *(Emeritus)*, H.W. Lilliefors, A.D. Kirsch, R.H. Shumway, J. Cornfield, J.L. Gastwirth, L. Shaw *(Research)*, N. Mantel *(Research)*, D. Krueger *(Research)*, S.W. Greenhouse *(Chairman)*, N.D. Singpurwalla *(Research)*, M. Halperin *(Research)*
Professorial Lecturer: E.E. Leone, J. Bailar III
Associate Professors: C.T. Ireland, R.E. Thomas, J.M. Lachin III *(Research)*
Associate Professorial Lecturers: M.A. Schwartz, J.H. Ware, K.M. Wolter
Assistant Professor: J.P. Dukes III
Adjunct Assistant Professor: J.K. Kim
Assistant Professorial Lecturers: W. Rutsey, F.C. Tousley

Bachelor of Arts or Bachelor of Science with a major in *applied statistics* (computer science option), *mathematical statistics*, or *statistics with an option in computer science (experimental)*—The following requirements must be fulfilled:

1. The general requirements as stated on pages 74 to 75.

2. The departmental advisor requires courses to be taken in satisfying the requirements for minimal training in the humanities and social sciences.

3. Prerequisite courses for all these majors—Math 31, 32, Stat 90.

4. (a) Required courses for the applied statistics major—Math 124. (Courses in computer science and some form of simulation are recommended. Foreign language is not required for this major.)

(b) Required courses in related areas for the mathematical statistics major—Math 140, 141, two years of elementary French, German or Russian, or equivalent. (Courses in computer science, mathematics, and some field of application are recommended.)

(c) Required courses for the statistics major with an option in computer science—Math 117, 118. (Foreign language is not required for this major, but is recommended for graduate students planning to go on to graduate school.)

5. (a) Required courses in the applied statistics major—Stat 106, 110, 117, 118, 119, 120, plus three approved courses in statistics.

(b) Required courses in the mathematical statistics major—Stat 106, 117, 118, 119, plus three approved courses in statistics.

(c) Required courses in the statistics major with an option in computer science—Stat 110, 118 (or two others), 119, 120, plus two approved courses in mathematics and statistics (Math 140, 141, 270, and Stat 189 and 198 recommended).

To pursue a business program, departmental approval of electives is required for all majors.

Students who need Special Honors in statistics should inquire of the Department for a statement of its policy.

Master of Science in the field of applied statistics or *Master of Arts in the field of mathematical statistics*—The program of study consists of 30 semester

Master of Science in the field of applied statistics—Prerequisite: a bachelor's degree with a major in applied statistics from this University, or an equivalent degree. If undergraduate study did not include equivalent required courses, those courses must be taken as prerequisite to graduate study.

Required: the general requirements, pages 88–90, including Stat 201–2. Courses are selected in consultation with the advisor.

Master of Arts in the field of mathematical statistics—Prerequisite: a bachelor's degree with a major in mathematical statistics from this University, or an equivalent degree. If undergraduate study did not include equivalent required courses, those courses must be taken as prerequisite to graduate study.

Required: the general requirements, pages 88–90, including Stat 201–2 and 217–18. The remaining 16 semester hours must be selected in consultation with the advisor.

Doctor of Philosophy in the field of mathematical statistics—Prerequisite: the degree of Master of Arts in the field of mathematical statistics from this University, or an equivalent degree.

Required: the general requirements, pages 88–90, including Stat 201–2 and 217–18. A minimum of 24 semester hours of graduate work must be taken in residence at this University before the General Examination may be completed. The General Examination consists of two written parts each followed by an oral examination. Part I covers mathematics and probability and must be taken after successful completion of Stat 200 or 217–18. Part II may be taken after the successful completion of the remaining core courses: Stat 201–2, 217–18, 219–20, 222, 223, and 224, and electives selected in consultation with the advisor. The oral requirement may be fulfilled by passing a reading knowledge examination in one foreign language and an examination in computer language. The successful completion of Stat 227 or 228 or 229 may fulfill the computer language requirement. Stat 227 is computer programming and does not always the requirement to pass a special examination should the computer option be elected as a field.

Research Fields: Bayesian inference, biostatistics, design of experiments, information theory, multivariate analysis, nonparametric statistics, probability, several variables, sampling, statistical inference, stochastic processes, and time series analysis.

Departmental prerequisite: One entrance unit in algebra is prerequisite to all first-group courses in statistics.

First Group

***51 Introduction to Business and Economic Statistics** (3) *Bright, Kern*

Lecture (3 hours), laboratory (1 hour). Frequency distributions, descriptive measures, probability, sampling, estimation, tests of hypotheses, regression and correlation, times series, index numbers. Laboratory fee, $18. (Fall and spring)

---

* Not to be counted toward the degree in the College of Business Administration. Only one of the five may be applied toward a degree.

*53 **Introduction to Statistics in Social Science** (3) Staff

Lecture (3 hours), laboratory (1 hour). Frequency distributions, descriptive measures, probability, sampling, estimation, tests of hypotheses, regression and correlation. Laboratory fee, $18. (Fall and spring)

*91 **Principles of Statistical Methods** (3) Lilliefors

Probability, frequency distributions and their characteristics, descriptive measures, estimation, tests of hypotheses, regression and correlation. Laboratory fee, $18. (Fall and spring)

†97 **Introduction to Computer Programming** (3) Staff

Lecture (2 hours), laboratory (2 hours). Computer and programming concepts. High-level language programs written by students will be run on the University computer. Laboratory fee, $25. (Fall and spring)

Second Group

103 **Sampling in Accounting** (3) Bright

(Formerly Statistics in Business)

Special emphasis on appreciation of sampling techniques in business decisions and in auditing; simple and stratified samples; master samples; opinion polling. Prerequisite: Stat 51, 53, 91, or equivalent. (Spring)

105 **Statistics in the Behavioral Sciences** (3) Kirsch

Lecture (3 hours), laboratory (1 hour). Advanced study of statistical techniques for research problems. Analysis of variance, correlation techniques, nonparametric techniques, sampling theory. Prerequisite: Stat 53 or equivalent and satisfactory performance on a placement examination. Laboratory fee, $18. (Fall and spring)

106 **Introduction to Computing** (3) Thomas

Development of basic computing ideas using a high-level language. Emphasis on correct design and implementation of programs using "structured programming". Prerequisite or concurrent registration: Math 31, or permission of the instructor. Laboratory fee, $25. (Fall)

110 **Computer Programming** (3) Thomas and Staff

Lecture (2 hours), laboratory (2 hours). Computer concepts beyond the introductory level; an introduction to assembly language and advanced high-level language programming. Prerequisite: Stat 106. Laboratory fee, $25. (Spring)

*111 **Business and Economic Statistics I** (3) Thomas and Staff

Statistical methods appropriate for applications in economics and business. (Fall)

112 **Business and Economic Statistics II** (3) Staff

Continuation of Stat 111 with emphasis on techniques of regression, Chi-square, sampling designs, index numbers and other topics used in economics and business. Prerequisite: Stat 111 or equivalent. (Spring)

* Stat 51, 53, 91, 111, and 127 are related in their subject matter, and credit hours for only one of the five may be applied toward a degree.

† Credit will not be given for both Stat 97 and Stat 195.

114 Data Structures (3) Staff

Files and file systems. Basic structure of processing operations, creation updating, sorting, merging, searching, linking, hashing. Introduction to data processing, storage, and retrieval. Emphasis on computer techniques. Prerequisite: Stat 110. Laboratory fee, $[illegible] (Fall)

117 Analysis of Variance (3) Staff

Lecture 2 hours, laboratory (1 hour). Introduction to the design of experiments and analysis of variance: random block, factorial, Latin squares, and analysis of covariance. Prerequisite: Stat 118. Laboratory fee, $18. (Spring)

118 Regression Analysis (3) Staff

Lecture (3 hours), laboratory (1 hour). Regression and correlation theory, simple, partial, and multiple. Prerequisite: 3 semester hours selected from Stat 51, 53, 91. Laboratory fee, $18. (Fall and spring)

119 Bases of Statistical Decision-making (arr.) Kem

For students in the Navy Graduate Financial Management Program only. Introduction to techniques of decision making, emphasis on applications rather than theory.

***123 Introduction to Econometrics** (3) Staff

Construction and testing of economic models: regression theory, parameter estimation, and statistical techniques applicable to economic models. Prerequisite: Econ 101, 102; Math 31 or 51; Stat 1[illegible] (Fall and spring)

†127 Statistics for the Biological Sciences (3) Greenhouse

Introduction to statistical techniques and reasoning applicable to the biological and related sciences. Properties of basic probability functions: binomial, Poisson, and normal. Data analysis, inference, and experimental design. (Fall and spring)

131 Contingency Table Techniques (3) Staff

Analysis of multidimensional contingency tables, including estimation, tests of hypotheses, and log-linear regression. Prerequisite: Stat 118 or permission of instructor. Laboratory fee, $18 (Spring)

133–34 Mathematical Models in Population Genetics (3–3) Staff

Basic elements of genetics and cell reproduction; deterministic models of gene frequency, the Hardy-Weinberg law; effects of mutation, migration, and selection on gene frequency; multiple loci and multiple alleles; interacting; Fisher's fundamental theorem of natural selection; stochastic models of changes in gene frequency, including methods of direct product branching processes and diffusion equation methods. (Academic year)

155 Introduction to Probability (3) Dirkse

Probability distribution, Bayes' theorem and postulate, mathematical expectation, laws of large numbers. Prerequisite: one entrance unit in algebra. (Summer)

157–58 Introduction to Mathematical Statistics (3–3) Dirkse

Distribution theory, sampling theory, estimation, hypothesis testing, regression analysis, experimental design. Prerequisite: differential and integral calculus. (Academic year)

---

* An interdepartmental course offered by the Departments of Statistics and Economics.

† Stat 51, 53, 91, 111, and 127 are related in their subject matter, and credit hours for only three of the five may be applied toward a degree.

159 **Principles of Bayesian Statistics** (3) Staff

Lecture 3 hours; laboratory 0 hours. Probability as a measure of uncertainty of knowledge; concepts and techniques of Bayesian inference. Prerequisite: three semesters of a calculus sequence or equivalent. Laboratory fee, $13.

161–62 **Information Theory** (3–3) Staff

Elementary development of information theory and applications to communication systems, psychology, linguistics, etc. Prerequisite: three semester hours selected from Stat 157, 158, 165, 166. Laboratory fee, $18.

165–66 **Multivariate Techniques** (3–3) Shumway

Application of multivariate statistical techniques to multidimensional research data from the behavioral, social, biological, medical, and physical sciences. Prerequisite: Stat 117, 157–58, and Math 124. Laboratory fee, $18. (Academic year)

181 **Applied Time Series Analysis** (3) Shumway

Auto- and cross-correlation spectral analysis, coherence, transfer relations, linear filters, seasonal adjustment, least squares regression, autoregressive moving average models, forecasting. Prerequisite: methods, spectral analysis of stationary and signal detection and discrimination methods. Prerequisites: a first course in matrices and calculus. Laboratory fee, $30. (Spring)

183 **Intermediate Statistical Laboratory** (3) Staff

Applications to advanced experimental design and other topics. Admission by permission of instructor. Laboratory fee $25. (Fall or spring)

187 **Theory of Sampling** (3) Staff

Problems of sampling and sample design. Prerequisite: Stat 91 or equivalent. (Fall)

188 **Nonparametric Statistical Inference** (3) Lilliefors

Statistical inference when the form of the underlying distribution is unspecified. Prerequisite: Stat 91 or equivalent. (Spring)

189–90 **Mathematical Probability and Applications** (3–3) Staff

Combinatorial analysis, conditional probability, stochastic independence, probability distributions, random variables, laws of large numbers. Prerequisite: differential and integral calculus. (Academic year)

191 **Statistics for Engineering and Management Sciences** (3) Leone

Applied probability; discrete and continuous distributions; descriptive statistics; principles and applications of estimation and testing; correlation and single and multi-variate regression; distribution-free tests. Prerequisite: Math 31. (Fall)

192 **Experimental Design for Engineering and Management Sciences** (3) Leone

Introduction to principles of design; models for the analysis of variance; crossed and nested experiments; factorials; response surfaces. Prerequisite: Stat 191 or permission of the instructor. (Spring)

193 **Survey Design** (3) Staff

Applications of survey methodology, including questionnaire design and wording, field methods, interviewer and nonresponse biases, and

quality control procedures. Problems in sample frame development. Prerequisite: Stat 147 or equivalent and permission of instructor. (Spring)

195 **Reading and Research in Statistics** (arr.) Staff
May be repeated once for credit. (Fall and spring)

*197 **Digital Computer Programming with Applications** (3) Thomas
Lecture (2 hours), laboratory (2 hours). Use of digital computers for statistical and other computational work. Writing, debugging, and running programs on the digital computer in the University Computer Center. Prerequisite: Stat 115 or Math 55 or permission of instructor. Laboratory fee, $25. (Fall and spring)

198 **Current Topics in Computer Programming** (3) Ruttan
Concepts of programming, programming languages, operating systems, commercial programming, compiler techniques. Prerequisite: Stat 114 or permission of instructor. Laboratory fee, $25. May be repeated for credit. (Spring)

Third Group

201–2 **Mathematical Statistics** (3–3) Ireland
Distribution theory, sampling theory, estimation, sufficient statistics, hypothesis testing, analysis of variance, multivariate normal distribution. Prerequisite: advanced calculus or permission of instructor. (Academic year)

205 **Data Analysis for Policy Decisions** (3) Kirsch
The framing of questions of importance in policy and the use of existing data bases to answer these questions. Laboratory fee, $20. Prerequisite: Stat 105 or equivalent. May be repeated once for credit. (Summer)

206 **Factor Analysis** (3) Kirsch
Concepts of factor analysis and their utility in various phases of research and related topics, including cluster analysis. Prerequisite: Stat 105 or equivalent and permission of instructor. Laboratory fee, $18. (Summer)

217–18 **Advanced ANOVA and Experimental Design** (3–3) Staff
Advanced theory and application of general linear hypotheses to experimental designs. Prerequisite: Stat 155–56 or 201–2. Math 55. (Academic year)

221 **Design of Experiments for Behavioral Sciences** (3) Kirsch
Applications of advanced experimental design to research problems in behavioral sciences and education. Prerequisite: Stat 105 or 170 or equivalent and permission of instructor. Not open to graduate students in Statistics. (Spring)

223–24 **Bayesian Inference** (3–3) Cornfield
Systematic development of Bayesian viewpoint, with applications to the classical problems of statistics. Prerequisite: Stat 201–2. (Academic year 1979–80 and alternate years.)

225–26 **Introduction to Biostatistics** (3–3) Cornfield
Probability models, inference, and study design as applied to

* Credit will not be given for both Stat 97 and Stat 197.

medical investigations. Prerequisite: Stat 201–2. (Academic year 1980–81 and alternate years.)

231 **Contingency Table Analysis** (3) Staff

A study of the theoretical bases underlying the analysis of categorical data. Prerequisite: Stat 201–2 or 257–58.

242 **Advanced Statistical Problems in Economic Analysis** (3) Gastwirth

Applications of advanced theory to economic data. (Spring)

257–58 **Distribution Theory** (3–3) Staff

Properties of distribution and characteristic functions; probability limit theorems and multiple theory; order statistics. Prerequisite: Stat 197–98 or 201–2. (Academic year 1979–80 and alternate years.)

259–60 **Advanced Mathematical Probability** (3–3) Dirkse

Measure theory, probability spaces, random variables, probability distributions, sequences and sums of random variables, conditioning, limit theorems, martingales. Prerequisite: Math 236 or equivalent. [Academic year 1980–81 and alternate years.]

261 **Sequential Design and Analysis** (3) Ware

Wald's theory of sequential design, optimal stopping, theory of sequential experiments. Prerequisite: Stat 201–2. [Spring, odd years.]

262 **Nonparametric Inference** (3) Lilliefors

Inference when the form of the underlying distribution is unspecified. [Fall, odd years.]

263–64 **Topics in Statistical Inference** (3–3) Lilliefors

Estimation, testing of statistical hypotheses, uses of sufficiency, likelihood ratio, Bayesian inference, and the use of game strategies in decision theory. Prerequisite: Stat 201–2 or 257–58. (Academic year 1980–81 and alternate years.)

265–66 **Multivariate Analysis** (3–3) Shirmeyer

Tests of significance, homogeneity, independence, canonical and vector correlations, multivariate normal distribution, generalized Student's ratio, multivariate linear hypothesis, and analysis of variance. Prerequisite: Stat 201–2 or 257–58; Math 124. (Academic year 1979–80 and alternate years.)

269 **Statistical Decision Theory** (3) Ware

Wald's theory of decision functions. Sequential analysis. Multi-decision problems. Bayesian theorems, complete class theorems, and other general decision theoretic results. Prerequisite: Stat 197–98 and 201–2 or 257–58. (Fall, even years.)

273–74 **Stochastic Processes** (3–3) Ware

Fundamental notions of Markov chains and processes, generating functions, recurrence, and theorems, random walk, Poisson processes, birth and death processes, applications. Prerequisite: Stat 197–98, and 201–2 or 257–58. (Academic year 1980–81 and alternate years.)

*275 **Econometrics I: Introduction** (3) Staff

Single equation models of economic behavior. Statistical methods for

*Interdepartmental course offered by the Departments of Statistics and Economics.

testing economic hypotheses and estimating parameters. Introduction to simultaneous equations problems. Prerequisite: Stat 157–58 or equivalent, or permission of instructor. Recommended: a course in matrix theory. (Fall)

*276 **Econometrics II: Simultaneous Equations Models** (3) Staff
Economic models and simultaneous equations systems. Prerequisite: Stat 275. (Spring)

*279 **Methods in Economic Statistics** (3) Staff
Statistical methods, such as [illegible], and index numbers used to summarize and analyze economic data. Prerequisite: Stat 111 or equivalent. (Fall and spring)

281 **Time Series Analysis I: Foundations** (3) Shumway
[illegible] of stationary time series. Differentiation, integration, spectral representations, linear filtering, mean square estimation, Fast Fourier Transform, test of large variance, autoregressive and moving average processes. Prerequisite: Stat 201–2 and 259–60 or [illegible]. (Fall, even years)

282 **Time Series Analysis II: Statistical Inference** (3) Shumway
Multivariate normal processes, spectral estimation, tests of hypotheses, regression, discrimination. Fisher's spectral analysis of variance. Prerequisite: Stat 281. (Spring, odd years)

283 **Advanced Statistical Laboratory** (3) Staff
Application of the University computer to complex statistical problems on an individual study basis. Admission by permission of instructor. Laboratory fee may be required. May be repeated with permission of the Department. (Fall and spring)

285–86 **Seminar: Special Topics in Sample Survey** (3–3) Wolter
Admission by permission of instructor. (Fall and spring)

287–88 **Modern Theory of Sample Surveys** (3–3) Wolter
Application of statistical theory to the sampling of human populations. Simple, stratified, cluster, double and subsampling. Special topics including super-population and model-based approaches. Prerequisites: Stat 91 and Math 21 or equivalent. (Academic year)

289 **Seminar** (3) Staff
Admission by permission of instructor. (Fall and spring)

†290 **Principles of Demography** (3) Staff
Introduction to basic demographic perspectives and data. Methods for analysis of population size, distribution and composition. Determinants and consequences of population trends. (Fall)

†291 **Methods of Demographic Analysis** (3) Staff
Basic methods for analysis of fertility, mortality, and migration. Population estimates and projections; estimation of demographic measures from incomplete data. (Spring)

295 **Reading and Research** (3) Staff
May be repeated once for credit. (Fall or spring)

* An interdepartmental course offered by the Departments of Statistics and Economics.
† An interdepartmental course offered by the Department of Commerce, Geography and Political Science, Sociology and Economics.

297 **Problems in Mathematical Statistics** (3) Staff

298 **Seminar: Special Topics** (3) Staff

299–300 **Thesis Research** (3–3) Staff
(Fall and spring)

Fourth Group

*378 **Seminar: Topics in Econometrics** (3) Staff
Limited to graduate students, primarily for doctoral students; offered as demand requires. A research seminar covering current econometric literature and special topics. Admission by permission of instructor.

398 **Advanced Reading and Research** (arr.) Staff
Limited to students preparing for the Doctor of Philosophy general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff
Limited to Doctor of Philosophy candidates. May be repeated for credit. (Fall and spring)

URBAN AND REGIONAL PLANNING—GRADUATE PROGRAM

Professor D.C. McGrath, Jr. *(Chairman)*
Professorial Lecturer S.J. Bellomo
Associate Professors S. Greene, S.S. Fuller
Adjunct Associate Professor J.N. Pearce
Assistant Professor D. Gale
Assistant Professorial Lecturer J.K. Lawler
Visiting Lecturer O.T. Carr, Jr.

A program leading to the degree of Master of Urban and Regional Planning, which provides preparation for professional practice in the planning field and areas of specialization in planning as components of programs leading to the degrees of Master of Public Administration, Doctor of Business Administration and Doctor of Public Administration, are offered by the School of Government and Business Administration (see pages 131–61).

Second Group

153 **Principles of Urban Planning and Design** (3) Greene
Studio course for undergraduates. Basic elements of urban planning and design applied to community problems. Survey of planner's role in developing and implementing creative solutions to urban problems. (Fall)

Third Group

201 **Introduction to Urban and Regional Planning** (3) McGrath and Staff
Introduction to history, concepts, and activities in urban and regional planning. Discussion of trends in urbanism and the influences of technology and social change. (Fall and spring)

* An interdepartmental course offered by the Departments of Statistics and Economics.

202 **Urban Planning Theory** (3) Gale

Development of the fundamental theories and concepts of urban growth and change, theories of the planning process, the role of politics in the planning process, and roles of the planner. Prerequisite: U&RP 201 or permission of instructor. (Fall and spring)

203 **Fundamentals of Urban Design** (4) Greene

Planning and design studio to develop and apply planning methods and graphic techniques; principles of land use and urban design; analysis of factors affecting community development and change. Open only to candidates for the degree of Master of Urban and Regional Planning. Laboratory fee $20. Prerequisite: U&RP 201 and 202 or permission of instructor. (Spring)

204 **Urban Development Planning** (3) Greene

Planning and design studio investigation of social, environmental and technological factors in planning. Application of comprehensive planning process to typical problems of community growth and change. Laboratory fee $20. Prerequisite: U&RP 203 or permission of instructor. (Fall)

205 **Urban Housing** (3) Fuller

Examination of the building industry, housing market characteristics, analytical techniques, national needs, costs, financing, federal programs, technology, rehabilitation, and policy formulation. Prerequisite: U&RP 201 (Spring)

206 **Community Facilities Planning** (3) Fuller

Planning implications of essential public facilities which comprise community infrastructure. Emphasis on developing an understanding of the special design, service, and locational requirements of various classes of community factors, the relationships among facilities and their effects on urban development and the community at large. Prerequisite: U&RP 201 or permission of instructor. (Spring)

207 **Land Development Planning** (3) McGrath

Selected problems in urban and regional planning applications of zoning, urban renewal and special programs available for the implementation of development plans. Prerequisite: U&RP 201 or permission of instructor. (Fall)

208 **Urban Transportation Planning** (3) McGrath

Relationships between land use and the movement of goods and people in urban areas. Transportation planning principles. Planning problems, methods for analyzing demand and systems for improving travel; roles of public agencies and private interests in the planning and development of various modes. Prerequisite: U&RP 201 (Spring)

209 **Urban Transportation Models** (3) Bellomo

Consideration of land use activity, trip generation and distribution, environmental impact, model choice models, traffic assignment and decision-making techniques. Review of detail studies, validation, interactions, applications and accuracy limitations of various mathematical models. Prerequisite: U&RP 208 or permission of instructor. (Fall)

210 **Urban Development Economics** (3) Lawle

Economic forces affecting urban growth and change; relationships

among cities, metropolitan areas, and regions in the context of the national economy; socioeconomic implications of urban land development policies; basic studies and methods of economic analysis. Prerequisite: Econ 217–18 or equivalent; U&RP 201. (Spring)

212 Methods of Urban and Regional Analysis (3) Fuller

Introduction to methods used to analyze, estimate, and forecast population, employment, income, and economic growth and development. Includes time series, index numbers, sampling, regression, shift-share, and input-output. Prerequisite: Stat 51 or equivalent. (Fall)

213 Social Factors in Urban Planning (3) Gale

Residential location decisions as they affect land use in metropolitan areas. Middle class, elderly, and minority mobility patterns; effects of discrimination, dislocation, condominiums, and historic preservation. Prerequisite: U&RP 201 or permission of instructor. (Summer)

215 Advanced Planning Problems (4) McGrath and Staff

Investigation of complex problems of the metropolitan region; analysis of findings, formulation of proposals, and presentation of material to faculty and cooperating groups. Multidisciplinary team and individual planning projects. Studio course. Laboratory fee, $20. Prerequisite: U&RP 203. (Spring)

218 Metropolitan and Regional Planning (3) Fuller

Multidisciplinary study of the methods of regional analysis and process of regional planning; development of projects of a regional scale requiring problem analysis, synthesis, and plan formulation. Studio course. Laboratory fee, $20. Prerequisite: U&RP 201 and 212 or permission of instructor. (Fall)

232 Urban Environment and the Planner (3) Fuller

Exploration of the relationship between people and their urban environment; emphasis on the role of the urban planner. Theory, research, planning methods, current issues, and laws examined. Prerequisite: U&RP 201 or permission of instructor. (Spring)

240 Federal and State Urban Policy Development (3) Gale

Investigation of contemporary trends in the evolution of federal and state environmental functions and programs affecting urban growth and development policy. Planning functions in the evolving relationships among units of federal, state, and metropolitan agencies. Prerequisite: U&RP 201 or permission of instructor. (Spring)

242 Fiscal Policy and Urban Planning (3) Gale

Consideration of municipal fiscal conditions and their implications for urban planning. Examination of capital program financing, tax policy and land use, and fiscal impact analysis of urban development. Prerequisite: U&RP 201 or permission of instructor. (Fall)

*276 **U. S. Architectural History** (3) Pearce

Basic stylistic developments in American architecture from the 17th through the 20th centuries, with special emphasis on the application of style recognition to buildings and environments in urban America. Architecture as evidence of American cultural history and guide to historic preservation. (Fall)

*Offering of the American Studies Program and the Urban and Regional Planning Depart-

*277–78 **Historic Preservation** (3–3) Pearce

The preservation movement and its literature. Review of current perience, preservation practice and techniques. Emerging aspects values affecting preservation activities. (Academic year)

290 Special Topics in Urban and Regional Planning (3) Staff

Experimental offering: new course topics and teaching methods. May be repeated for credit. (Fall or spring)

295 **Research Methods** (3) Staff

Directed research and investigation of special problems in community development. May be repeated once for credit. (Fall and spring)

297 Directed Readings and Research in Urban and Regional Planning (1) Staff

299 **Thesis Seminar** (3) Fuller

Development of thesis questions, research philosophy and methodology. (Fall and spring)

300 **Thesis Research** (3) Staff

(Fall and spring)

Fourth Group

Fourth group courses are primarily for doctoral students, and are offered as the demand requires. May be open to other graduate students at the discretion of the Department.

311–12 **Seminar: Public-Private Sector Institutions and Relationships** (3–3) Chitwood

An analysis and critique of alternative theoretical frameworks for describing, understanding, and predicting the nature, values, and success of American public and private institutions. Problems, potentials, and alternatives for emerging public and private institutional arrangements to meet the needs of society.

397 Advanced Reading and Research (arr.) Staff

Limited to students preparing for the Doctor of Business Administration or Doctor of Public Administration general examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.) Staff

Limited to Doctor of Business Administration or Doctor of Public Administration candidates. May be repeated for credit. (Fall and spring)

WOMEN'S STUDIES—GRADUATE PROGRAM

Associate Professorial Lecturer R.H. Osborn

Adjunct Assistant Professors E. Bromfield, P.M. Palmer (Coordinator for Academic Affairs)

* Joint offering of the History and Urban and Regional Planning Departments and the Women's Studies Program.

Committee on Women's Studies

V.R. Allan, E. Bloomfield, C.W. Conable, T.Z. Lavine, R.H. Osborn, P.M. Palmer, S. Quitslund, R. Wallace

The Graduate School of Arts and Sciences offers an interdisciplinary program leading to the degree of Master of Arts in Special Studies with a concentration in Women's Studies, directed by the Committee on Women's Studies and drawing upon faculty from various departments within the university and resource persons in the community.

Women's studies seeks to examine and integrate the contributions of established academic disciplines to an understanding of the historical and contemporary role and status of women and to provide training necessary to evaluate and formulate equitable public policy for women. Each student will work closely with an advisor in designing a program to meet individual research interests and professional goals. Prospective candidates should consult with the director of the Women's Studies Program.

Master of Arts in Special Studies with a Concentration in Women's Studies—Prerequisite: a bachelor's degree from an accredited college or university. Students are expected to have completed the prerequisites to graduate courses.

Required: the general requirements, pages 80–86, and 36 semester hours of course work, with or without a thesis. At least 24 hours must be taken in arts and sciences departments. WStu 220, 225, and AmCvilHist 186 are required for all students; WStu 287 and 296 are required for students who do not elect a thesis. WStu 288 300 are required for those who do elect a thesis. A graduate-level methodology course in one of the social sciences is required. A maximum of 24 hours in women's studies is permitted. The remaining hours must be divided between two other fields. All candidates are required to pass a Master's Comprehensive Examination. There is no tool requirement.

220 Perspectives on Women (3) Palmer

Research and theory from the social sciences and humanities as they influence the concept of public policies on women at work, in families, and in education. (Fall)

221 Research Issues in Women's Studies (3) Palmer

Socialization and the educational system, work and the economy, sexuality and the family, health and life cycle issues. Problem identification in these and other areas; introduction to current research. Prerequisite: WStu 220. (Spring)

225 Feminist Theory (3) Staff

Theoretical foundations of feminism in the U.S. Theories and proposals for change currently espoused. Although focus is primarily on feminism of contemporary white America, some third world and European thought will be considered. (Spring)

235 Women's Careers: Work, Family, and Educational Choices (3) Osborn

(Formerly Counseling and Career Development of Women)

Multidimensional analysis of factors, theories, problems and practices in career development and its relationship to counseling women. (Fall)

240 Public Policy (3) Staff

Systematic analysis of public policy formation at the federal, state and local levels as it relates to the status of women. Strategies for change and impact of the women's movement. Team and individual

research projects on executive decision-making, legislation and ... implementation, and political party structures. (Spring)

241 **Women and the Law** (3) Bloomfield
Legal status of women. Emphasis on marital status, employment, media, education, health services, crime, and the Constitution. (Fall and spring)

251 **Women, Literature, and the Arts** Staff
Woman as subject and object. Examination of stereotypes, themes, language, patterns, and symbolism in works by and about women. Particular attention to the woman as artist and the development of feminist criticism. (Spring)

*260 **Women in the American Work Force** (3) Palmer
Multidisciplinary analysis of women's role in the labor force and historical changes in that role. Societal view of women's work in the home and outside it; interrelationships of women in and out of the work force; women's contributions, traditionally and during national crises; class, race, and ethnic differences. (Fall)

270 **Seminar: Selected Topics** (arr.) Staff

280 **Independent Study** (3) Staff
May be repeated for credit. Arrangements must be made with sponsoring faculty member prior to registration.

283 **Practicum in Women's Studies** (3) Palmer
Study of the changing status of women through supervised assignment to public and private agencies engaged in education, counseling, political action, and research. Placement arrangements should be made the semester prior to registration for this course.

284 **Practicum** (arr.) Palmer, Staff

295 **Independent Research in Women's Studies** (arr.)
Individual library or field research. Program advisor's approval of a written proposal required. Staff

299–300 **Thesis Research** (3–3)

ZOOLOGY

See **Biological Sciences.**

* Joint offering of the American Studies Program and the Women's Studies Program.



FACULTY AND STAFF OF INSTRUCTION

Columbian College of Arts and Sciences

Graduate School of Arts and Sciences

School of Education and Human Development

School of Government and Business Administration

School of Public and International Affairs

EMERITI

Caroline Lander Adams, *Professor Emeritus of Botany*
B.A. 1925, Illinois College; M.S. 1926, University of Chicago; Ph.D. 1932, University of Wisconsin

Errett Cyril Albritton, *Professor Emeritus of Physiology*
B.A. 1916, University of Missouri; M.D. 1921, Johns Hopkins University

Grover LaMarr Angel, *Professor Emeritus of Education*
B.A. 1929, High Point College; M.A. in Ed. 1946, Ed.D. 1952, George Washington University

Ruth Harriet Atwell, *Professor Emeritus of Physical Education for Women*
Ph.B. 1918, Denison University; M.A. in Ed. 1933, George Washington University

Richard Adrian Barrett, *Professor Emeritus of Business Administration*
B.A. 1930, Amherst College; M.B.A. 1932, Harvard University; D.B.A. 1972, George Washington University

Gretchen Rogers Bolwell, *Professor Emeritus of German*
B.A. 1930, M.A. 1931, George Washington University; Ph.D. 1938, Johns Hopkins University

Robert Whitney Bolwell, *Professor Emeritus of American Literature*
B.A. 1916, Case Western Reserve University; M.A. 1917, Ph.D. 1921, Columbia University; Litt.D. 1957, George Washington University

John Withrow Brewer, *Professor Emeritus of Political Science and International Law*
B.A. 1926, M.A. 1930, Ph.D. 1932, Princeton University

Arthur Edward Burns, *Professor Emeritus of Economics*
B.A. 1931, M.A. 1934, University of California, Berkeley; Ph.D. 1935, George Washington University

Elizabeth Burtner, *Professor Emeritus of Physical Education*
B.A. 1927, Hood College; M.A. 1935, Columbia University

Paul Calabrisi, *Professor Emeritus of Anatomy*
B.A. 1931, Catholic University of America; M.A. 1940, George Washington University; Ph.D. 1955, Cambridge University, England

Wesley Thomas Carroll, *Professor Emeritus of Education*
B.S. 1933, Iowa State University of Science and Technology; M.A. 1940, Ph.D. 1952, University of Nebraska

Richard Bernard Castell, *Director Emeritus of the Student Health Service*
B.A. 1932, M.D. 1935, George Washington University

James Harold Coberly, *Professor Emeritus of English*
B.A. 1933, M.A. 1938, Ph.D. 1949, George Washington University

Elbridge Colby, *Professor Emeritus of Journalism*
B.A. 1912, M.A. 1913, Ph.D. 1922, Columbia University

Oswald Symister Colclough, *Professor Emeritus of Law; Dean of Faculties Emeritus; Emeritus Director of the Patent, Trademark, and Copyright Research Institute*
B.S. 1920, U.S. Naval Academy; LL.B. 1935, Sc.D. 1961, George Washington University; LL.D. 1948, Muhlenberg College

Charles William Cole, *Professor Emeritus of English*
B.A. 1930, M.A. 1931, Ph.D. 1939, George Washington University

George Frederick Conner, *Associate Professor Emeritus of Business Administration*
B.S. 1929, U.S. Military Academy; M.B.A. 1938, Harvard University

Milton Crane, *Professor Emeritus of English*
B.A. 1937, M.A. 1938, Columbia University; M.A. 1941, Ph.D. 1942, Harvard University

Vincent James DeAngelis, *Professor Emeritus of Physical Education*
B.S. in P.E. 1939, M.A. in Ed. 1948, George Washington University

Alan Thomas Deibert, *Professor Emeritus of Romance Languages*
B.A. 1918, Gettysburg College; M.A. 1922, Harvard University

William Webster Diehl, *Professor Emeritus of Mycology*
B.A. 1914, Miami University; M.S. 1915, Iowa State University of Science and Technology; **Ph.D. 1932, Harvard University**

James Carlton Dockeray, *Professor Emeritus of Finance*
B.A. 1923, Ohio Wesleyan University; M.A. 1931, Ph.D. 1936, Ohio State University

William Rankin Duryee, *Research Professor Emeritus of Pathology (Experimental)*
B.A. 1927, Ph.D. 1933, Yale University

Frederick Harrell Gibbs, *Professor Emeritus of Health Care Administration*
B.S. 1958, University of Maryland; M.H.A. 1959, University of Minnesota

Raymond George Hanken, *Professor Emeritus of Human Kinetics and Leisure Studies*
B.S. in P.E. 1938, M.A. in Ed. 1952, George Washington University

Ira Bowers Hansen, *Professor Emeritus of Zoology*
B.S. 1923, M.A. 1929, Wesleyan University; Ph.D. 1932, University of Chicago

Clarence Richard Hartman, *Associate Professor Emeritus of Microbiology*
B.A. 1933, M.D. 1936, George Washington University

Henry William Herzog, *Vice President and Treasurer Emeritus*
B.S. in C.E. 1930, LL.D. 1978, George Washington University

Thomas Willard Holland, *Professor Emeritus of Labor Economics*
B.A. 1924, University of Michigan; LL.B. 1934, Columbia University; Ph.D. 1939, University of Wisconsin

Thelma Hunt, *Professor Emeritus of Psychology*
B.A. 1924, M.A. 1925, Ph.D. 1927, M.D. 1935, George Washington University

Herbert Jehle, *Professor Emeritus of Physics*
Dr.Ing. 1933, Institute of Technology, Berlin

Joe Lee Jessup, *Professor Emeritus of Business Administration*
B.S. in B.A. 1936, University of Alabama; M.B.A. 1941, Harvard University; LL.D. 1964, University of Chungang, Korea

Eva Mayne Johnson, *Professor Emeritus of Psychology*
B.A. 1949, M.A. 1951, Ph.D. 1957, George Washington University

Everett Herschel Johnson, *Professor Emeritus of Statistics*
B.A. 1928, DePauw University; M.A. 1929, Lehigh University; Ph.D. 1942, University of Michigan

Elmer Louis Kayser, *Professor Emeritus of European History; Dean Emeritus of the Division of University Students; University Historian*
B.A. 1917, M.A. 1918, LL.D. 1948, George Washington University; Ph.D. 1932, Columbia University; L.H.D. 1975, Mount Vernon College

Virginia Randolph Kirkbride, *Professor Emeritus of Educational Psychology*
B.A. 1941, M.A. 1942, University of Nebraska; Ed.D. 1959, George Washington University

Frances Kirkpatrick, *Professor Emeritus of Home Economics*
B.S. 1919, University of Missouri; M.A. 1929, Columbia University

George Martin Koehl, *Professor Emeritus of Physics*
B.A. 1931, University of North Carolina; M.A. 1933, George Washington University

Solomon Kullback, *Professor Emeritus of Statistics*
B.S. 1927, City University of New York, City College; M.A. 1929, Columbia University; Ph.D. 1934, George Washington University

John Francis Latimer, *Professor Emeritus of Classics*
B.A. 1922, Litt. D. 1964, Mississippi College; M.A. 1926, University of Chicago; Ph.D. 1929, Yale University

Helen Bennett Lawrence, *Professor Emeritus of Physical Education for Women*
B.S. in P.E. 1934, M.A. 1938, George Washington University

Chester Elwood Leese, *Professor Emeritus of Physiology*
B.A. 1922, M.A. 1925, Ph.D. 1930, University of Iowa

Wolfram Karl Legner, *Professor Emeritus of German*
B.A. 1923, Harvard University; M.A. 1932, Ph.D. 1936, University of Pennsylvania

Laurence Pereira Leite, *Professor Emeritus of Art*
M.A. 1956, Ph.D. 1966, Johns Hopkins University

Kurt London, *Professor Emeritus of International Affairs*
Ph.D. 1923, University of Würzburg

William Allan MacDonald, *Professor Emeritus of Art and of Archeology*
B.A. 1940, Oberlin College; M.A. 1942, Ph.D. 1943, Johns Hopkins University

Eugene Ross Magruder, *Associate Professor Emeritus of Business Administration*
B.B.A. 1950, M.B.A. 1951, University of Texas at Austin; Ph.D. 1959, Ohio State University

John Russell Mason, *Librarian Emeritus, Curator of Art Emeritus*
B.A. 1923, M.A. 1925, George Washington University; M.S. in L.S. 1938, Columbia University

Muriel Hope McClanahan, *Associate Professor Emeritus of English*
B.A. 1923, Colorado College; M.A. 1927, Ph.D. 1940, University of Pittsburgh

Florence Marie Mears, *Professor Emeritus of Mathematics*
B.A. 1917, Goucher College; M.A. 1923, Ph.D. 1927, Cornell University

Howard Maxwell Merriman, *Professor Emeritus of American Diplomatic History*
B.A. 1930, M.A. 1931, University of Cincinnati; M.A. 1932, Ph.D. 1937, Harvard University

Franz Henry Michael, *Professor Emeritus of International Affairs and Far Eastern History*
Sinological Diploma 1930, University of Berlin; Referendar 1931, Dr.Jur. 1933, University of Freiburg

Robert Hamilton Moore, *Professor Emeritus of English*
B.A. 1913, M.A. 1914, Louisiana University; Ph.D. 1926, University of Illinois

Edith Elizabeth Mortensen, *Professor Emeritus of Zoology*
B.A. 1926, Colorado College; M.A. 1927, University of Minnesota; Ph.D. 1947, George Washington University

Sam Clark Munson, *Professor Emeritus of Biology*
B.S. 1926, M.S. 1931, Mississippi State University; Ph.D. 1936, University of Maryland

Charles Randolph Noller, *Professor Emeritus of Chemistry*
B.S. 1921, University of Wisconsin; M.S. 1923, Ph.D. 1926, University of Illinois

Richard Norman Owens, *Professor Emeritus of Business Administration*
B.A. 1917, University of Missouri; M.A. 1919, Ph.D. 1928, University of Illinois; C.P.A. 1920, State of Kansas

Katie Fenley Parker, *Professor Emeritus of Botany*
B.A. 1926, M.A. 1932, University of California, Berkeley; Ph.D. 1945, University of Arizona

Thomas Martin Peery, *Professor Emeritus of Pathology*
B.S. 1928, D.Med. 1931, Newberry College; M.D. 1931, Medical University of South Carolina

Karl Herman Pfuntner, *Associate Professor Emeritus of Philosophy*
B.A. 1919, M.A. 1920, George Washington University; Ph.B. 1927, Georgetown University

Lucy Irene Platt, *Assistant Professor Emeritus of Pathology*
B.S. 1926, Columbia College; M.D. 1930, University of Maryland

Mary Louise Robbins, *Professor Emeritus of Microbiology*
B.A. 1926, American University; M.A. 1928, Ph.D. 1945, George Washington University

Sarah Root, *Professor Emeritus of Education*
B.S. 1927, Montgomery College; M.A. 1932, University of Chicago; Ed.D. 1948, George Washington University

Myrna Pauline Sedgwick, *Administrative Secretary Emeritus*
B.A. 1911, Wellesley College

Edward Henry Sehrt, *Professor Emeritus of German*
B.A. 1911, Ph.D. 1915, Johns Hopkins University

Waldo Sommers, *Professor Emeritus of Public Administration*
B.A. 1927, Heidelberg College; M.A. 1934, Ph.D. 1948, Yale University

Edwin Lockwood Stevens, *Professor Emeritus of Speech*
B.A. 1936, Rutgers—The State University; M.A. 1942, Columbia University

Karl Ernest Stromsen, *Professor Emeritus of Public Administration*
B.A. 1930, Pomona College; Ph.D. 1935, University of California, Berkeley

Harold Griffith Sutton, *Director of Admissions Emeritus*
B.A. 1918, Ohio State University; M.S. 1921, Columbia University

Geza Teleki, *Professor Emeritus of Geology*
Ph.D. 1936, University of Vienna

Ira Rockwood Telford, *Professor Emeritus of Anatomy*
B.A. 1931, M.A. 1933, University of Utah; Ph.D. 1942, George Washington University

Kathryn Mildred Towne, *Professor Emeritus of Home Economics*
B.S. 1923, Montana State University; M.A. 1930, Columbia University

Cuthbert Raymond Treadwell, *Professor Emeritus of Biochemistry*
B.A. 1934, Battle Creek College; M.S. 1935, Ph.D. 1939, University of Michigan

William Lewis Turner, *Associate Professor Emeritus of English*
B.A. 1934, M.A. 1941, Ph.D. 1952, University of Pennsylvania

Robert Corbin Vincent, *Professor Emeritus of Chemistry*
B.A. 1935, M.A. 1937, Ph.D. 1940, Cornell University

Donald Stevenson Watrous, *Professor Emeritus of Economics*
B.A. 1930, University of British Columbia; Ph.D. 1935, University of California, Berkeley

Robert Lucas Wemtraub, *Professor Emeritus of Botany*
B.S. 1931, M.A. 1933, Ph.D. 1938, George Washington University

Warren Reed West, *Professor Emeritus of Political Science*
B.A. 1918, George Washington University; Ph.D. 1922, Johns Hopkins University

Ralph Kirby White, *Professor Emeritus of Social Psychology*
B.A. 1929, Wesleyan University; Ph.D. 1937, Stanford University

Marvin Milton Weisey, *Professor Emeritus of Management*
B.S. 1935, New York University; M.A. 1943, Ph.D. 1967, American University

Donnell Brooks Young, *Professor Emeritus of Zoology*
B.S. 1911, Amherst College; Ph.D. 1923, Columbia University

ACTIVE*

Fred Paul Abramson, *Associate Professor of Pharmacology*
B.A. 1962, Case Western Reserve University; Ph.D. 1965, Ohio State University

Eugene Abravanel, *Professor of Psychology*
B.A. 1955, University of Michigan; M.A. 1960, Swarthmore College; Ph.D. 1965, University of California, Berkeley

Jeanne Vermilyea Ackerman, *Assistant Professorial Lecturer in Human Kinetics and Leisure Studies*
B.A. [illegible], M.A. in Ed. 1972, George Washington University

Elizabeth Byrne Adams, *Associate Professor of Management*
B.S. [illegible] University of New York, Queens College; M.A. in Ed. 1967, George Washington University; Ph.D. 1974, American University

H. Douglas Adamson, *Adjunct Instructor in English*
B.A. 1967, University of California, Berkeley; M.A. 1972, San Jose State University

* The University Faculty is composed of the President of the University, the Vice President for Academic Affairs, the Director of Admissions, the Registrar, the University Librarian, the Treasurer, the Director of the Student Health Service, and the membership of the several college and school faculties

Lewis Francis Affronti, *Professor of Microbiology*
B.A. 1950, M.A. 1951, State University of New York at Buffalo; Ph.D. 1958, Duke University

C. Michael Aho, *Assistant Professor of Economics*
B.A. 1971, University of Michigan; Ph.D. 1978, Massachusetts Institute of Technology

Ernest Narinder Albert, *Professor of Anatomy*
B.S. 1959, High Point College; M.S. 1963, University of Pittsburgh; Ph.D. 1965, Georgetown University

Yousef Al-Doory, *Associate Professor of Pathology (Laboratory Medicine)*
B.S. 1948, University of Baghdad; M.A. 1951, University of Texas at Austin; Ph.D. 1954, Louisiana State University and Agricultural and Mechanical College

Frank Duane Allan, *Professor of Anatomy*
B.S. 1947, M.S. 1949, University of Utah; Ph.D. 1954, Louisiana State University and Agricultural and Mechanical College

*John Gage Allee, Jr., *Professor of English, Dean of the Division of University Students*
B.S. 1956, M.A. 1958, George Washington University; Ph.D. 1965, Johns Hopkins University

Catherine Ann Allen, *Adjunct Instructor in Business Administration*
B.S. 1965, University of Missouri; M.S. 1975, University of Maryland

Willard Alman, *Assistant Professorial Lecturer in Mathematics*
B.S. 1967, Virginia Polytechnic Institute and State University; Ph.D. 1969, University of Virginia

Diane Graber Altscher, *Assistant Professorial Lecturer in Education*
B.S. 1967, M.A. 1969, Ohio University; Ph.D. 1977, George Washington University

David Aron Altshuler, *Assistant Professor of Religion*
B.A., M.A. 1971, Brown University; Ph.D. 1977, Hebrew Union College

Frederick Amling, *Professor of Business Finance*
B.A. 1948, Baldwin-Wallace College; M.B.A. 1949, Miami University; Ph.D. 1957, University of Pennsylvania

Jeffrey Clifford Anderson, *Assistant Professor of Art*
B.A. 1970, University of [illegible], M.F.A. 1975, Ph.D. 1980, Princeton University

Rebecca Jane Anderson, *Assistant Professor of Pharmacology*
B.A. 1971, Coe College; Ph.D. 1975, George[illegible] University

*Avery Delano Andrews, *Associate Professor of History, Assistant Dean of the Graduate School of Arts and Sciences*
B.A. 1950, Harvard University; LL.B. 1953, M.A. 1958, Ph.D. 1962, University of Pennsylvania

John Lawrence Angel, *Professorial Lecturer in Anatomy and Anthropology*
B.A. 1935, Ph.D. 1942, Harvard University

Viki Steffy Annand, *Assistant Professorial Lecturer in Human Kinetics and Leisure Studies*
B.S. 1969, Pennsylvania State University; M.Ed. 1973, George Washington University

Ricardo Anzola-Betancourt, *Professorial Lecturer in Human Kinetics and Leisure Studies*
B.Arch. 1969, Cornell University

Daniel Appleman, *Professorial Lecturer in Geology*
B.S. 1954, California Institute of Technology; M.A. 1958, Ph.D. 1960, Johns Hopkins University

Susan Jane Armstrong, *Lecturer in English*
B.A. 1971, George Washington University

Nancy D. Arnesen, *Lecturer in English*
B.A. 1968, University of Michigan; M.A. 1968, Kent State University

Joseph Aschheim, *Professor of Economics*
B.A. 1951, University of California, Berkeley; M.A. 1953, Ph.D. 1954, Harvard University

[illegible] Lynn Atkins, *Professor of Biology*
B.S. 1967, University of Texas at Austin; M.A. 1969, East Texas State University; Ph.D. 1970, Texas A&M University

On sabbatical leave fall semester 1979.
On sabbatical leave spring semester 1980

William Johnson Auton, *Adjunct Associate Professor of Health Care Administration*
B.B.A. 1965, George Washington University; M.A. 1966, Roosevelt University

Julius Axelrod, *Distinguished Professor of Science; Professorial Lecturer in Pharmacology*
B.S. 1941, City University of New York, City College; M.A. 1941, New York University; Ph.D. 1955, LL.D. 1971, George Washington University; Sc.D. 1966, University of Chicago

Ines Azar, *Assistant Professor of Spanish*
M.A. 1969, Ph.D. 1974, Johns Hopkins University

William Back, *Associate Professorial Lecturer in Geology*
B.S. 1946, University of Illinois; M.S. 1950, University of California, Berkeley; M.P.A. 1967, Harvard University; Ph.D. 1969, University of Nevada

Joseph Baclawski, *Professorial Lecturer in Geography*
B.A. 1947, M.A. 1948, Ph.D. 1951, University of Michigan

Catherine Tudish Bader, *Visiting Instructor in English*
B.A. 1971, M.A. 1973, University of Southern Illinois

John Bailar III, *Professorial Lecturer in Statistics*
B.A. 1949, University of Colorado; M.D. 1955, Yale University; Ph.D. 1973, American University

John Martyn Bailey, *Professor of Biochemistry*
B.S. 1949, Ph.D. 1952, D.Sc. 1970, University of Wales

Robert Edward Baker, *Professor of Education; Acting Dean of the School of Education and Human Development*
B.S. in Ed. 1939, State University of New York at Buffalo; M.A. 1954, Catholic University of America; M.A. in P.A. 1956, Ed.D. 1957, George Washington University

Amiri Baraka, *Jenny McKean Moore Visiting Lecturer in Creative Writing*

Ruth Lillian Aaronson Bari, *Professor of Mathematics*
B.A. 1943, City University of New York, Brooklyn College; M.A. 1944, Ph.D. 1966, Johns Hopkins University

Shirley Russell Barnett, *Associate Professor of Spanish*
B.A. 1946, Vassar College; M.A. 1948, Vanderbilt University; Ph.D. 1956, University of Minnesota

Albert Barnhart, *Assistant Professorial Lecturer in Art*
B.A. 1967, University of Maryland; M.A. 1974, State University of New York College, Oswego

Theodore M. Barnhill, *Assistant Professor of Business Administration*
B.S. 1966, Northeast Louisiana University; M.S. 1969, M.B.A. 1971, Ph.D. 1974, University of Michigan

*James Richard Barth, *Associate Professor of Economics*
B.A. 1966, California State University at Sacramento; M.A. 1967, University of New Mexico; Ph.D. 1972, Ohio State University

David Basch, *Studio Lecturer in Applied Music (Violin)*
B.A. 1973, Mus.M. 1975, George Washington University

Elio Lee Battaglia, *Assistant Professorial Lecturer in Photography*
B.J. 1958, M.A. 1968, University of Missouri

Samuel Baum, *Professorial Lecturer in Geography and Regional Science*
B.A. 1950, City University of New York, Brooklyn College

Caroline Gardner Beckjord, *Lecturer in English*
B.A. 1964, Vassar College; M.A. 1966, Columbia University

Salvatore John Bellomo, *Professorial Lecturer in Urban and Regional Planning*
B.S. 1956, Fordham University; M.S.P. 1957, D.Engr. 1971, Catholic University of America

Robert Stephen Bennett, *Associate Professorial Lecturer in Forensic Sciences*
LL.B. 1964, Georgetown University; LL.M. 1965, Harvard University

* On sabbatical leave fall semester 1979

Otto Bergmann, *Professor of Physics*
Ph.D. 1949, University of Vienna

David Francis Bergwall, *Assistant Professor of Health Care Administration; Assistant Dean of the School of Government and Business Administration*
B.S. 1969, M.B.A. 1970, Ball State University; D.B.A. 1973, George Washington University

Lee Sheward Bielski, *Professor of Speech*
B.S. 1940, Ohio University; M.A. 1944, University of Michigan

Philip Stanley Birnbaum, *Associate Professor of Health Care Administration and of Health Care Sciences; Dean for Administrative Affairs of the Medical Center*
B.S. in M.E. 1948, M.S. in M.E. 1949, Carnegie-Mellon University; B.C.E. 1954, Rensselaer Polytechnic Institute

Guy Black, *Professor of Business Economics*
B.S. 1941, Harvard University; M.A. 1948, Ph.D. 1951, University of Chicago

Jeffrey Robert Blank, *Assistant Research Professor of Education*
B.A. 1969, Dickinson College; M.S.T. 1975, State University of New York College at Brockport; Ph.D. 1978, Syracuse University

Sherman Bloom, *Professor of Pathology*
B.A. 1955, M.D. 1960, New York University

Elaine Bloomfield, *Adjunct Assistant Professor of Women's Studies*
B.A. 1967, Case Western Reserve University; J.D. 1971, George Washington University

Charlotte Renee Blount, *Associate Professorial Lecturer in Journalism*
B.A. 1974, American University

Elliot Blum, *Associate Clinical Professor of Psychology*
B.B.A. 1958, City University of New York, City College; M.S. 1960, Long Island University; Ph.D. 1965, Florida State University

George Bodnar, *Assistant Professor of Accounting*
B.S., B.A. 1970, Bucknell University; M.B.A. 1973, Ph.D. 1975, University of Pennsylvania

Margaret Emma Boeckmann, *Assistant Professor of Sociology*
B.A. 1964, Barnard College; M.A.T. 1965, Ph.D. 1974, Johns Hopkins University

Clarence E. Bohn, *Associate Professorial Lecturer in Forensic Sciences*
B.S. 1949, Michigan State University; J.D. 1950, Georgetown University

John Borriello, *Clinical Professor of Psychology*
B.A. 1956, M.Ed. 1961, Boston University; Ph.D. 1967, University of Minnesota

James William Borton, *Lecturer in English*
B.A. 1974, M.A. 1976, University of Maryland

John Gordon Boswell, *Professor of Education*
B.A. in Ed. 1953, M.A. in Ed. 1956, Ed.D. 1963, George Washington University

***Perry Botwin**, *Professor of Special Education; Acting Assistant Dean of the School of Education and Human Development*
B.S. 1942, Rutgers—The State University; M.A. 1947, New York University; Ed.D. 1957, Columbia University

Lloyd Spencer Bowling, *Professor of Speech and Hearing*
B.A. 1954, M.A. 1957, Ed.D. 1964, University of Maryland

Thomas Elliot Bowman, *Adjunct Professor of Biological Sciences*
B.S. 1941, Harvard University; M.A. 1948, University of California, Berkeley; Ph.D. 1954, University of California, Los Angeles

John Lawrence Boyle, *Lecturer in Special Education*
B.S. 1968, Indiana University of Pennsylvania; M.Ed. 1969, Loyola College

George Robert Bozzini, *Associate Professor of English*
B.S. 1961, Ph.D. 1971, Georgetown University

Linda Brandt, *Associate Professor of Psychology*
B.A. 1961, Elmhurst College; M.A. 1965, Clark University; Ph.D. 1973, University of London

Sarah Harkrader Brau, *Lecturer in English*
B.A. 1958, M.A.T. 1966, Duke University

*On sabbatical leave spring semester 1980.

James Lowell Breen, *Professor of Human Kinetics and Leisure Studies*
B.S. 1948, Eastern Illinois University; M.S. 1949, Ph.D. 1959, University of Illinois

*Marcella Brenner, *Professor of Education*
B.S. in Ed. 1934, Johns Hopkins University; M.A. 1949, American University; Ed.D. 196[illegible] George Washington University

Mary Diane Majerus Brewer, *Associate Professor of Speech*
B.A. 1963, M.A. 1965, University of Iowa

Harold Frederick Bright, *Professor of Statistics; Provost and Vice President for Academic Affairs*
B.A. 1937, Lake Forest College; M.S. 1944, University of Rochester; Ph.D. 1952, University of Texas at Austin

A. D. Britt, *Professor of Chemistry*
B.S. 1957, West Texas State University; M.A. 1961, Ph.D. 1963, Washington University

John Caruthers Broderick, *Adjunct Professor of English*
B.A. 1948, Southwestern at Memphis; M.A. 1949, Ph.D. 1953, University of North Carolina

Stuart Lee Brodsky, *Associate Professorial Lecturer in Mathematics*
B.S. 1964, Illinois Institute of Technology; M.S. 1965, Ph.D. 1969, Stanford University

Michael George Bromley, *Lecturer in Health Care Administration*
B.S. 1968, Medical College of South Carolina

Alison Spence Brooks, *Assistant Professor of Anthropology*
B.A. 1965, Radcliffe College; M.A. 1967, Ph.D. 1979, Harvard University

Barry Lee Brown, *Associate Professorial Lecturer in Biological Sciences*
B.S.A. 1966, M.S. 1968, University of Georgia; Ph.D. 1972, Purdue University

David Alan Brown, *Professorial Lecturer in Art*
B.A. 1964, Harvard University; M.A. 1967, Ph.D. 1973, Yale University

†David Springer Brown, *Professor of Management*
B.A. 1936, University of Maine at Orono; Ph.D. 1955, Syracuse University

Frederick James Brown, Jr., *Visiting Professor of Education*
B.A. 1947, M.Ed. 1951, Western Maryland College; Ed.D. 1962, Columbia University

Robert Guy Brown, *Professor of Sociology*
B.A. 1949, University of Rhode Island; M.A. 1961, Ph.D. 1960, University of North Carolina

Paul Theodore Bruder, *Adjunct Assistant Professor of Health Care Administration*
B.S. in Gen.Std. 1970, M.A. in H.C.A. 1972, D.P.A. 1977, George Washington University

Arnold Rahn Bruhn, *Assistant Professor of Psychology*
B.A. 1963, M.A. 1966, University of Portland; Ph.D. 1976, Duke University

David Brusick, *Adjunct Assistant Professor of Genetics*
B.S. 1964, University of Illinois; M.S. 1965, Ph.D. 1970, Illinois State University

Ben Burdetsky, *Professor of Personnel and Labor Relations*
B.S. 1950, M.S. 1958, Temple University; Ph.D. 1968, American University

Elisabeth Ann Burkhardt, *Lecturer in Human Kinetics and Leisure Studies*
B.S. 1966, University of Maryland

James Franklin Burks, *Professor of French*
B.A. 1951, M.A. 1952, University of Cincinnati; Ph.D. 1957, Indiana University

Martha Burns, *Associate Professor of Education*
B.S. 1964, University of Bridgeport; M.Ed. 1967, Ed.D. 1971, Pennsylvania State University

Martin Alexander Buzas, *Adjunct Professor of Geology*
B.A. 1958, University of Connecticut; M.S. 1960, Brown University; Ph.D. 1963, Yale University

Willard Edmund Caldwell, *Professor of Psychology*
B.A. 1940, M.A. 1941, University of Florida; Ph.D. 1946, Cornell University

Peter George Callas, *Assistant Professorial Lecturer in Education*
B.A. 1949, M.A. 1955, Western Maryland College; Ed.D. 197[illegible] George Washington University

---

* On leave of absence spring semester 1980

† On sabbatical leave spring semester 1980.

Edward Alan Caress, *Professor of Chemistry; Assistant Dean of the Graduate School of Arts and Sciences*
B.A. 1958, Dartmouth College; Ph.D. 1963, University of Rochester

Rose Friedman Caron, *Adjunct Professor of Psychology*
B.A. 1948, Vassar College; M.A. 1950, Ph.D. 1955, University of Chicago

Oliver T. Carr, Jr., *Visiting Lecturer in Urban Development Planning*

Gerald Vincent Carroll, *Professor of Geology*
B.A. 1943, Lehigh University; Ph.D. 1952, Yale University

Susan J. Carroll, *Instructor in Political Science*
B.A. 1972, Miami University; M.A. 1975, Indiana University

Thomas Frank Carroll, *Adjunct Professor of Economics*
B.A. 1942, Case Western Reserve University, M.S. 1947, Ph.D. 1950, Cornell University

Barbara Gilbert Carson, *Assistant Professorial Lecturer in American Civilization*
B.A. 1963, Brown University, M.A. 1965, University of Delaware

*Geoffrey Carter, *Assistant Professor of English*
B.A. 1963, Cambridge University; Ph.D. 1969, University of Pennsylvania

Patricia Murphy Carter, *Lecturer in English*
B.A. 1951, M.A. 1970, M.A. in Ed. 1977, George Washington University

Marie Mullaney Cassidy, *Professor of Physiology*
B.S. (General) 1957, B.S. (Special) 1958, M.S. 1959, Ph.D. 1962, National University of Ireland

Michael Scott Castleberry, *Assistant Professor of Special Education*
B.A. 1966, University of North Carolina; M.A. in Ed. 1972, Ed.D. 1973, George Washington University

Bayard Lacey Catron, *Associate Professor of Public Administration*
B.A. 1963 Grinnell College; M.A. 1965, University of Chicago; M.C.P. 1972, Ph.D. 1975, University of California, Berkeley

Lenore Teal Cervantes, *Lecturer in English*
B.A. 1937, M.A. 1940, University of Nebraska

Soo Young Cha, *Assistant Professorial Lecturer in Human Kinetics and Leisure Studies*
B.A. 1961, Seoul National University

Fenner Albert Chace, Jr., *Adjunct Professor of Biological Sciences*
B.A. 1930, M.A. 1931, Ph.D. 1934, Harvard University

Charles McKay Chambers, *Associate Professorial Lecturer in Mathematics*
B.S. 1962, M.S. 1963, Ph.D. 1964, University of Alabama; J.D. 1976, George Washington University

William Weymouth Chase, *Professorial Lecturer in Education*
B.A. 1948, M.A. 1949, Colorado State College, Ed.D. 1956, Indiana University

Stephen Reed Chitwood, *Professor of Public Administration*
B.A. 1962, University of Colorado, M.P.A. 1965, Ph.D. 1966 University of Southern California; J.D. 1977, George Washington University

Yang-Ming Chu, *Associate Research Professor of Microbiology*
B.S. 1959, University of Washington, M.S. 1964, Ph.D. 1967, George Washington University

Robert Paul Churchill, *Assistant Professor of Philosophy*
B.A. 1969, M.A. 1972, Ph.D. 1974, Johns Hopkins University

Ira Hubert Cisin, *Professor of Sociology*
B.S. 1939, New York University, M.A. 1951, Ph.D. 1957, American University

Astere Evarist Claeyssens, Jr., *Associate Professor of English*
B.A. 1948, University of Illinois; M.A. 1952, Columbia University

Betty Jo Clifford, *Clinical Instructor in Art Therapy*
M.S. in Art Ed. 1965, State University of New York at Buffalo

Anthony George Coates, *Professor of Geology*
B.S. 1959, Ph.D. 1963, University of London

* On sabbatical leave spring semester 1980.

Joseph Francis Coates, *Professorial Lecturer in Management Science and Public Affairs*
B.S. 1951, Polytechnic Institute of Brooklyn; M.S. 1953, Pennsylvania State University

Vary Taylor Coates, *Adjunct Associate Professor of Public Affairs*
B.A. 1957, Furman University; M.A. 1966, Ph.D. 1972, George Washington University

Harry Charles Coffey, *Adjunct Assistant Professor of Health Care Administration*
B.A. 1966, Providence College; M.A. 1972, Maryknoll Seminary; M.A. in H.C.A. 1975, George Washington University

*Mary Ann Bieter Coffland, *Associate Professor of Romance Languages*
B.A. 1952, College of St. Catherine; M.A. 1957, Ph.D. 1965, University of Minnesota

Stanley Lee Cohen, *Professorial Lecturer in Psychology*
B.A. 1963, M.A. 1966, Ph.D. 1971, George Washington University

Victor Hugo Cohn, *Professor of Pharmacology*
B.S. 1952, Lehigh University; M.A. 1954, Harvard University; Ph.D. 1961, George Washington University

James Coldsmith, *Associate Professorial Lecturer in Journalism*
B.A. 1950, Baker University; M.S.J. 1951, Northwestern University

†Richard Louis Cole, *Associate Professor of Political Science and Public Affairs*
B.A. 1967, M.A. 1969, North Texas State University; Ph.D. 1973, Purdue University

Mary Ellen Coleman, *Professor of Education*
B.S. 1947, Madison College; M.A. in Ed. 1950, George Washington University

B. D. Colen, *Associate Professorial Lecturer in Journalism*
B.A. 1973, George Washington University

Frederick Joseph Colher, *Assistant Professorial Lecturer in Geology*
B.S. 1958, Tufts University

Leonard Cornelius Collins, *Professorial Lecturer in Business Administration*
B.A. 1943, Boston College; LL.B. 1948, Catholic University of America; LL.M. 1953, Georgetown University

Robert Long Combs, *Assistant Professor of English*
B.A. 1965, University of Southern Mississippi; Ph.D. 1972, University of South Carolina

T. Allan Comp, *Associate Professorial Lecturer in American Civilization*
B.A. 1965, California State University, Fullerton; M.A. 1969, Ph.D. 1972, University of Delaware

Joseph John Cordes, *Assistant Professor of Economics*
B.A. 1971, Stanford University; M.S. 1975, Ph.D. 1977, University of Wisconsin

‡Jerome Cornfield, *Professor of Statistics*
B.S. 1933, New York University

Ermino Costa, *Professorial Lecturer in Pharmacology*
M.D. 1947, University of Cagliari, Italy

Constance Christian Costigan, *Assistant Professor of Design*
B.S. 1957, Simmons College; M.A. 1965, American University

Kenneth Cotton, *Lecturer in Human Kinetics and Leisure Studies*

Raymond Shearv Cottrell, Jr., *Professor of Special Education*
B.S. 1951, State University of New York at Albany; M.S. 1959, Ed.D. 1967, Syracuse University

Raymond Leslie Courage, *Associate Professorial Lecturer in Journalism*
B.A. 1949, M.A. 1951, University of Michigan

*Thomas Francis Courtless, Jr., *Professor of Law and Sociology*
B.A. 1951, Pennsylvania State University; M.A. 1955, Ph.D. 1958, University of Maryland

*John Patrick Coyne, *Associate Professor of Management Science*
B.S. 1967, Iona College; M.S. 1968, Ph.D. 1970, Lehigh University

---

* On sabbatical leave fall semester 1979
† On sabbatical leave academic year 1979-80
‡ On sabbatical leave spring semester 1980.

Martha B. Cramer, *Adjunct Instructor in English*
B.A. 1969, Ohio Wesleyan University; M.Ed. 1972, Rutgers—The State University

Pamela J. Cressey, *Assistant Professorial Lecturer in American Civilization and in Anthropology*
B.A. 1968, University of California, Los Angeles; M.A. 1975, Ph.D. 1978, University of Iowa

Camille Joanna Crombie, *Lecturer in English*
B.A. 1973, Mary Washington College; M.A. 1977, George Washington University

Theodore Oscar Cron, *Associate Professorial Lecturer in Journalism*
B.A. 1952, M.A.T. 1954, Harvard University

Gary Edward Crum, *Assistant Professorial Lecturer in Health Care Administration*
B.S. 1967, College of William and Mary; M.S. 1969, Ph.D. 1972, University of Kentucky; **M.P.H. 1973, Columbia University**

Michèle Schiavone Cruz-Sáenz, *Adjunct Assistant Professor of Romance Languages*
B.A. 1971, Connecticut College; M.A. 1974, Ph.D. 1976, University of Pennsylvania

Ronald Crystal, *Adjunct Professor of Genetics*
B.A. 1962, Tufts University; M.S. 1963, M.D. 1968, University of Pennsylvania

Jonathan Walkley Cummings, *Associate Clinical Professor of Psychology*
B.A. 1949, University of Vermont; Ph.D. 1954, University of Illinois

Cortlandt Beck Cunningham, *Professorial Lecturer in Forensic Sciences*
B.S. 1948, Northwestern University; J.D. 1954, Miami University; M.S. 1971, George Washington University

Phyllis Deutsch Daen, *Associate Clinical Professor of Psychology*
B.S. 1950, City University of New York, Queens College; Ph.D. 1960, Adelphi University

Kurt John Darr, *Professor of Health Care Administration*
B.A. 1961, Concordia College, Minnesota; J.D. 1964, M.H.A. 1966, University of Minnesota; **D.Sc. 1973, Johns Hopkins University**

Calvin O'Neil Dash, *Studio Lecturer in Applied Music (Voice)*
B.S. 1951, M.S. 1952, Juilliard School of Music; A.Mus.D. 1962, Eastman School of Music

Tracy Edgar Daugherty, *Assistant Professorial Lecturer in English*
B.S. 1967, Spring Hill College; M.A. 1969, University of Arkansas; Ph.D. 1978, University of Georgia

Philip Gardner Davidoff, *Assistant Professorial Lecturer in Human Kinetics and Leisure Studies*
B.A. 1962, M.A. 1963, University of Pennsylvania

Herbert John Davis, *Associate Professor of Business Administration*
B.S. 1965, Villanova University; M.B.A. 1968, East Carolina University; Ph.D. 1974, Louisiana State University

Walter Navarro Davis, *Assistant Professorial Lecturer in Education*
versity; **Ed.D. 1975, American University**
B.A. 1956, North Carolina Central University; M.A. in Ed. 1969, George Washington Uni-

Roderic Hollett Davison, *Professor of European History*
B.A. 1937, Princeton University; M.A. 1938, Ph.D. 1942, Harvard University

Christopher J. Deering, *Adjunct Instructor in Political Science*
B.A. 1974, University of Southern California; M.A. 1975, University of California, Santa Barbara

Rosalie Frances De Giovanni-Donnelly, *Associate Professorial Lecturer in Microbiology*
B.A. 1947, M.A. 1953, City University of New York, Brooklyn College; Ph.D. 1961, Columbia University

William Charles DeMull, *Lecturer in Human Kinetics and Leisure Studies*
B.A. 1972, Michigan State University

Frank Landt Dennis, *Professorial Lecturer in Journalism*
B.A. 1929, University of Oklahoma; LL.B. 1935, Harvard University

Adela Grant DePauw, *Professor of American History*
B.A. 1951, Swarthmore College; **Ph.D. 1964, Johns Hopkins University**

Jane Martha Deren, *Assistant Professorial Lecturer in English*
B.A. 1967, M.A. 1972, Ph.D. 1977, Temple University

Milton Charles Devolites, *Professor of Health Care Administration*
B.A. 1938, Harvard University; M.A. 1953, Baylor University

John Adams DeWitt, *Studio Lecturer in Applied Music (Trumpet)*
B.M. 1973, Northwestern University

Bess Effrat Dick, *Lecturer in English*
B.A. 1932, New York University; LL.B. 1935, Brooklyn Law School

Jessie Carleton Calver Dickens, *Associate Professorial Lecturer in Biological Sciences*
B.A. 1939, M.S. 1969, George Washington University

Antoinette LaVerne Dickerson, *Associate Research Professor of Human Kinetics and Leisure Studies*
B.S. 1958, Virginia State College; M.A. 1959, Ed.D. 1973, New York University

John Phillip Dirkse III, *Assistant Professor of Statistics*
B.S. 1967, University of Wisconsin Oshkosh; M.S. 1971, Ph.D. 1973, Purdue University

Salvatore Frank DAvita, *Professor of Business Administration*
B.B.S. 1957, New York University; M.B.A. 1958, Ohio State University; D.B.A. 1968, Harvard University

Robert Paul Donaldson, *Assistant Professor of Biology*
B.A. 1964, University of Texas at Austin; M.S. 1966, Miami University; Ph.D. 1971, Michigan State University

Allan Drexler, *Professorial Lecturer in Education*
B.S. 1950, Long Island University; M.S. 1952, Pennsylvania State University; Ph.D. 1970, Purdue University

Daniel Maccabaeus Dribin, *Professorial Lecturer in Mathematics*
B.S. 1933, M.S. 1934, Ph.D. 1936, University of Chicago

Robert Martin Dunn, Jr., *Professor of Economics*
B.A. 1960, Williams College; M.A. 1963, Ph.D. 1967, Stanford University

Robert Frederick Dyer, *Associate Professor of Business Administration*
B.S. in B.A. 1965, M.B.A. 1966, Bowling Green State University; D.B.A. 1972, University of Maryland

John Joseph Dziak, *Professorial Lecturer in International Affairs*
B.A. 1961, M.A. 1964, Seton Hall University; Ph.D. 1971, Georgetown University

Roy Brandon Eastin, *Professor of Business Administration*
B.A. 1940, M.A. 1945, George Washington University; Ph.D. 1963, American University

Ellen W. Echerenia, *Adjunct Instructor in English*
B.A. 1963, Fairleigh Dickinson University; M.A. 1969, Middlebury College

William Henry Eddy, *Lecturer in Special Education*
A.B. 1966, Bethany Nazarene College; M.S. 1968, George Washington University

David Lee Edgell, *Associate Professorial Lecturer in Human Kinetics and Leisure Studies*
B.S. 1961, University of Kansas; B.A. 1968, American University; M.A. 1970, Indiana University; Ph.D. 1974, University of Minnesota

John Ettus, *Professor of Engineering and Applied Science and Adjunct Professor of Mathematics*
B.C.E. 1952, City University of New York, City College; M.S. in C.E. 1958, Columbia University; D.Sc. 1967, George Washington University

Julian Eisenstein, *Professor of Physics*
B.S. 1941, M.A. 1942, Ph.D. 1948, Harvard University

Adel El-Assiry, *Professor of Business Administration*
B.Com. 1960, Cairo University, Egypt; M.B.A. 1966, Ph.D. 1970, Ohio State University

Rodney Eldridge, *Associate Professor of International Finance*
B.A. 1956, M.S. 1958, University of Wisconsin; Ph.D. 1965, Columbia University

Charles Fox Elliott, *Assistant Professor of Political Science and International Affairs*
B.A. 1953, Ph.D. 1964, Harvard University; M.A. 1958, University of California, Berkeley

Lloyd Hartman Elliott, *Professor of Higher Education; President of the University*
B.A. 1937, Glenville State College; M.A. 1939, LL.D. 1967, West Virginia University; LL.D. 1954, University of Colorado; LL.D. 1965, University of New Hampshire; LL.D. 1966, Colby College; LL.D. 1966, Concord College; LL.D. 1969, University of Maine at Orono; LL.D. 1971, Georgetown University

Warrick Elgin Elrod, Jr., *Professorial Lecturer in Business Administration*
B.A. 1959, Harvard University; M.A. 1965, Northwestern University; M.A. 1966, George Washington University

Richard Ferdinand Ericson, *Professor of Management*
B.A. 1941, M.B.A. 1942, University of Chicago; Ph.D. 1956, Indiana University

Dorothy Alita Evans, *Associate Clinical Professor of Psychology*
B.S. 1963, University of Illinois; M.A. 1966, Ph.D. 1968, Southern Illinois University

Grace Elizabeth Orvis Evans, *Professorial Lecturer in Art*
B.A. 1943, M.A. 1946, University of Minnesota

Grose Evans, *Adjunct Associate Professor of Art*
B.F.A. 1939, M.A. 1940, Ohio State University; Ph.D. 1956, Johns Hopkins University

Katharine Sinnitt Evans, *Assistant Professorial Lecturer in English*
B.A. 1961, University of Washington; M.A. 1967, B.A. 1970, University of Oregon

Marilyn Jane Evans, *Associate Professorial Lecturer in Chinese*
B.A. 1958, Middlebury College; Ph.D. 1965, Yale University

Michael J. Evans, *Assistant Professorial Lecturer in Mathematics*
B.S. 1961, Armstrong State College; M.A. 1967, Ph.D. 1970, Syracuse University

Robert K. Evans, *Visiting Assistant Professor of Anthropology*
B.A. 1966, University of Illinois; M.A. 1967, Ph.D. 1971, University of California, Los Angeles

Donald Frank Eversmann, *Adjunct Assistant Professor of Health Care Administration*
B.S. 1967, Cornell University; M.B.A. 1972, Southern Illinois University

Sergio Egidio Fabro, *Professor of Obstetrics and Gynecology and Research Professor of Pharmacolgy*
M.D. 1958, University of Milan; Ph.D. 1965, Ph.D. 1966, University of Rome; Ph.D. 1967, University of London

Thomas Arthur Farrand, *Instructor in Speech*
B.A. 1962, Ripon College; M.A. 1964, Marquette University

Gail Elissa Farrelly, *Adjunct Instructor in Accounting*
B.S. 1965, College of Mount Saint Vincent; M.A. 1969, Fordham University; M.B.A. 1969, Iona College

Joseph Fehrenbach, *Lecturer in Geography and Regional Science*
B.A. 1963, University of Delaware; M.A. 1977, University of Georgia

Bernice Feinstein, *Assistant Professorial Lecturer in Music*
B.A. 1947, Smith College; M.A. 1958, Ed.D. 1972, Columbia University

Sima Ficks, *Assistant Professorial Lecturer in Russian*
Diploma 1964, Kiev State University

Cynthia Field, *Adjunct Associate Professor of American Civilization*
B.A. 1963, Bryn Mawr College; M.A. 1965, M.Ed. 1974, University of Virginia

Jonathan D. Fife, *Adjunct Assistant Professor of Education Policy*
B.S.S. 1969, City College of New York; M.P.A. 1971, University of Minnesota; M.S. 1973, State University of New York at Albany; Ed.D. 1975, Pennsylvania State University

Nicolae Filipescu, *Professor of Chemistry*
Ph.D. 1957, University of Bucharest; Postdoctoral Research Associate, M.D. 1964, 1975, George Washington University

Dana Fischer, *Assistant Professor of Political Science and International Affairs*
B.A. 1965, Lewis and Clark College; M.A. 1968, Ph.D. 1973, University of Washington

Elizabeth Ann Fisher, *Adjunct Assistant Professor of Classics*
B.A. 1966, Northwestern University; M.A. 1971, Ph.D. 1972, Harvard University

Joseph Lyman Fisher, *Adjunct Professor of Economics*
B.S. 1935, Brooklyn College; M.A. 1938, Ph.D. 1947, Harvard University; M.A. in Ed. 19[illegible], George Washington University

Sadie Fishman, *Clinical Instructor in Art Therapy*
B.F.A. 1974, Maryland Institute College of Art; M.A. 1975, George Washington University

Allan Kress Fitzsimmons, *Assistant Professor of Geography and Regional Science*
B.A. 1965, M.A. 1969, California State University, Northridge; Ph.D. 1975, University of California, Los Angeles

Joseph William Fleck, *Associate Professor of Education*
B.A. 1957, City University of New York, Queens College; M.Ed. 1969, Central State University; Ph.D. 1975, University of Oklahoma

Marilyn Fleming, *Clinical Instructor in Art Therapy*
B.F.A. 1954, University of Illinois; M.A. 1975, George Washington University

William Robert Fonda, *Associate Professorial Lecturer in Journalism*

Ernest Harvey Forman, *Associate Professor of Management Science*
B.S. 1964, University of Rochester; M.S. 1969, Johns Hopkins University; D.Sc. 1975, George Washington University

William Harris Frank, *Assistant Professorial Lecturer in Business Administration*
B.A. 1970, Ripon College; J.D. 1973, George Washington University

Richard John Frankie, *Professor of Education*
B.A. 1952, M.A. 1955, University of Michigan; Ed.D. 1966, Wayne State University

Douglas Carleton Frechtling, *Assistant Professorial Lecturer in Human Kinetics and Leisure Studies*
B.A. 1965, Hamilton College; M.Phil. 1970, Ph.D. 1973, George Washington University

John Eric Fredland, *Associate Professorial Lecturer in Economics*
B.A. 1964, Harvard University; M.A. 1968, Ph.D. 1970, University of Michigan

Richard E. French, *Associate Professorial Lecturer in Economics*
B.B.A. 1961, M.A. 1963, Ph.D. 1967, University of Oklahoma

Roderick Stuart French, *Associate Professor of Philosophy; Director, Division of Experimental Programs*
B.A. 1954, Kenyon College; B.D. 1957, Episcopal Theological School; S.T.M. 1965, Union Theological Seminary; Ph.D. 1971, George Washington University

Maxine Benjamin Freund, *Research Instructor in Special Education*
B.A. 1968, University of Minnesota; M.A. 1973, George Washington University

John Andrew Frey, *Professor of Romance Languages*
B.A. 1951, M.A. 1952, University of Cincinnati; Ph.D. 1957, Catholic University of America

William Edward Fuhrman, *Studio Lecturer in Applied Music (Flute)*
Mus.B. 1968, Catholic University of America

Stephen Souther Fuller, *Associate Professor of Urban Planning*
B.A. 1962, Rutgers, The State University; M.C.P. 1964, University of Mississippi; Ph.D. 1969, Cornell University

Carol Susan Jonas Gage, *Lecturer in Education*
B.A. 1968, Finch College; M.A. 1970, New York University; M.A. in Ed. 1974, George Washington University

Dennis Gale, *Assistant Professor of Urban and Regional Planning*
B.A. 1964, Bucknell University; M.S. 1968, Boston University; M.Ed. 1969, Harvard University; M.C.P. 1971, University of Pennsylvania

Michael Graham Gallagher, *Associate Professor of Accounting*
B.A. in Govt. 1960, J.D. 1964, LL.M. 1971, George Washington University; C.P.A. 1965, State of Virginia

Linda Lou Gallo, *Assistant Professor of Biochemistry*
B.S. 1959, West Virginia University; M.S. 1963, Ph.D. 1969, George Washington University

Robert Charles Gallo, *Adjunct Professor of Genetics*
B.A. 1959, Providence College; M.D. 1963, Thomas Jefferson University

Martin George Galvin, *Assistant Professorial Lecturer in English*
B.A. 1958, Villanova University; M.A. 1968, Ph.D. 1977, University of Maryland

Linda Gantt, *Clinical Instructor in Art Therapy*
B.A. 1966, North Texas State University; M.A. 1974, George Washington University

Robert Norton Ganz, Jr., *Professor of English*
B.A. 1949, M.A. 1951, Ph.D. 1959, Harvard University

Daniel Dee Garner, *Associate Professorial Lecturer in Forensic Sciences*
B.A. 1969, David Lipscomb College; Ph.D. 1973, University of Tennessee

Eleanor Radcliffe Garner, *Assistant Professorial Lecturer in English*
B.A. in Ed. 1959, M.A. in Ed. 1941, George Washington University; M.S. 1965, Ph.D. 1971, **Georgetown University**

Nathan Conant Garner, *Assistant Professor of Drama; Director of Theater*
B.A. 1963, Tufts University; M.A. 1966, University of North Carolina

Carleton Theodore Garrett, *Associate Professor of Pathology*
B.A. 1962, **Lehigh University; M.D. 1966, Johns Hopkins University**; Ph.D. 1971, University of **Wisconsin**

Joseph Lewis Gastwirth, *Professor of Statistics and Economics*
B.S. 1958, Yale University; M.A. 1960, Princeton University; Ph.D. 1963, Columbia University

*Harry Irving Gates, *Associate Professor of Sculpture*
B.F.A. 1958, M.F.A. 1960, University of Illinois

James David Gates, *Assistant Professorial Lecturer in Education*
B.A. 1962, Hiram College; M.A. 1956, Columbia University; Ed.D. 1975, George Washington University

Alfonso Geiger, *Associate Professorial Lecturer in Geology*
B.S. 1950, University of Michigan

Lyndale Harpster George, *Associate Professor of Human Kinetics and Leisure Studies*
B.S. in P.E. 1949, M.A. in Ed. 1952, A.P.C. 1961, George Washington University

Phyllis Eleanor Gieseler, *Studio Lecturer in Applied Music (Voice)*

David Gillespie, *Adjunct Professor of Genetics*
B.S. 1961, Tufts University; Ph.D. 1965, University of Illinois

Howard Frank Gillette, Jr., *Associate Professor of American Civilization*
B.A. 1964, Ph.D. 1970, Yale University

Leon Gintzig, *Professor of Hospital Administration; Associate Dean of the School of Government and Business Administration*
B.S. 1947, Boston University; M.S. 1954, Northwestern University; Ph.D. 1958, University of Texas

Audrey L. Glassman, *Assistant Professorial Lecturer in Art*
B.A. 1946, **Syracuse University; M.F.A. 1975, American University**

Bernard Sholom Glassman, *Associate Professorial Lecturer in Art*
B.S. 1947, Harvard University

†Irving Isadore Glick, *Associate Professor of Mathematics*
B.A. 1954, **Johns Hopkins University; Ph.D. 1961, University of Maryland**

Joe Jeff Goldblatt, *Lecturer in Human Kinetics and Leisure Studies*
B.F.A. 1974, **St. Edward's University**

‡Robert Stanley Goldfarb, *Associate Professor of Economics*
B.A. 1964, Columbia University; M.A. 1965, M.Phil. 1967, Ph.D. 1969, Yale University

Allan L. Goldstein, *Professor of Biochemistry*
B.S. 1955, **Wagner College; M.S. 1961, Ph.D. 1964, Rutgers University**

Victor Karl Golla, *Associate Professor of Anthropology*
B.A. 1960, **Ph.D. 1970, University of California, Berkeley**

Myron Gordon, *Professor of Geography and Regional Sciences*
B.A. 1942, City University of New York, City College; M.A. 1954, Ph.D. 1958, Columbia University

Andrew Jay Graham, *Assistant Professorial Lecturer in Forensic Sciences*
B.A. 1965, **Yale University; J.D. 1968, New York University**

---

* On sabbatical leave fall semester 1979.
† On sabbatical leave academic year 1979-80.
‡ On sabbatical leave fall semester 1979; on leave of absence spring semester 1980.

Marvin David Green, *Associate Professor of Mathematics*
B.S. 1961, M.A. 1962, Ph.D. 1965, University of Cincinnati

Susan Kay Green, *Assistant Professor of Psychology*
B.A. 1971, Michigan State University; M.A. 1973, Ph.D. 1975, Loyola University of Chicago

Joseph Arthur Greenberg, *Associate Professor of Education*
B.S. in Bus. Ed. 1966, Salem State College; Ed.M. 1968, Ed.D. 1974, Boston University

John Greene, *Lecturer in English*
B.A. 1972, University College, Ireland

*Sherwin Greene, *Associate Professor of Urban Planning*
B.Arch. 1959, M.S. in C.R.P. 1960, Illinois Institute of Technology

Samuel W. Greenhouse, *Professor of Statistics*
B.S. 1938, City University of New York, City College; M.A. 1954, Ph.D. 1959, George Washington University

Candice Hart Greer, *Adjunct Assistant Professor of English*
B.A. 1972, George Washington University; M.A. 1975, University of Pennsylvania

Fuller Griffith, *Assistant Professor of Graphics*
B.S. 1952, University of Wisconsin; M.F.A. 1969, George Washington University

William Byron Griffith, *Associate Professor of Philosophy*
B.A. 1958, University of Notre Dame; M.A. 1962, Ph.D. 1963, Yale University

Phillip Donald Grub, *Aryamehr Professor of Multinational Management; Assistant to the President for International Programs*
B.A., B.A. in Ed. 1953, Eastern Washington State College; M.B.A. 1960, D.B.A. 1964, George Washington University

*Francis Stanley Grubar, *Professor of Art*
B.A. 1948, M.A. 1949, University of Maryland; M.A. 1952, Ph.D. 1966, Johns Hopkins University

Joseph Grunwald, *Adjunct Professor of Economics*
B.S. 1943, Johns Hopkins University; Ph.D. 1950, Columbia University

Fred William Grupp, Jr., *Associate Professorial Lecturer in Public Administration*
B.A. 1954, Swarthmore College; M.A. 1963, Ph.D. 1968, University of Pennsylvania

Pamela Sabalos Gudnason, *Lecturer in English*
B.A. 1977, George Washington University

Eileen Morris Guenther, *Studio Lecturer in Applied Music (Organ)*
B.A., Mus.B. 1970, University of Kansas; M.A., D.M.A. 1974, Catholic University of America

Margaret Beltz Guenther, *Associate Professorial Lecturer in German*
B.A. 1950, M.A. 1953, University of Kansas; Ph.D. 1958, Radcliffe College

Roy James Guenther, *Adjunct Assistant Professor of Music*
B.Mus.Ed. 1966, Mus.B. 1968, University of Kansas; M.A. 1974, Catholic University of America

Murli Manohar Gupta, *Adjunct Assistant Professor of Mathematics*
B.S. 1961, M.S. 1965, Agra University, India; M.S. 1969, Ph.D. 1971, University of Saskatchewan, Canada

†Andrew Gyorgy, *Professor of International Affairs and Political Science*
B.A. 1937, J.D. 1938, University of Budapest; M.A. 1939, University of California, Berkeley; Ph.D. 1943, University of California, Los Angeles

Jonathan Haas, *Assistant Professorial Lecturer in American Civilization and in Anthropology*
B.A. 1970, University of Arizona; M.A. 1974, M.Phil. 1976, Columbia University

Sheldon Edward Haber, *Professor of Economics*
B.A. 1954, City University of New York, City College; Ph.D. 1958, Johns Hopkins University

Eleanor Martha Hadley, *Professorial Lecturer in Economics*
B.A. 1938, Mills College; M.A. 1943, Ph.D. 1949, Harvard University

Neil Blaine Hadley, *Assistant Professorial Lecturer in Health Care Administration*
B.A. 1949, University of Northern Iowa; M.H.A. 1958, Baylor University; M.S. 1962, Arizona State University; D.B.A. 1971, George Washington University

---

* On sabbatical leave fall semester 1979.
† On sabbatical leave spring semester 1980.

*Robert Arthur Hadley, *Associate Professor of History*
B.A. 1959, Bowdoin College; M.A. 1960, Ph.D. 1964, University of Pennsylvania

Robin Howard Hagaman, *Assistant Professorial Lecturer in Health Care Administration*
B.S. 1958, Arkansas State University; M.B.A. 1964, George Washington University

E. William Hahn, *Assistant Professor of Management Science*
B.S. 1963, M.S. 1965, Ph.D. 1969, Purdue University

Max Halperin, *Research Professor of Statistics*
B.S. 1940, University of Omaha; M.S. 1941, University of Iowa; Ph.D. 1950, University of North Carolina

William Charles Handorf, *Associate Professor of Business Administration*
B.A. 1966, M.B.A. 1967, University of Michigan; Ph.D. 1973, Michigan State University

William Walter Hardgrave, *Associate Professor of Management Science*
B.A. 1959, Princeton University; D.Engr. 1962, Johns Hopkins University

John Hardt, *Professorial Lecturer in Economics*
B.A. 1945, M.A. 1948, University of Washington; M.A. 1950, Ph.D. 1955, Columbia University

Michael Mont Harmon, *Associate Professor of Public Administration*
B.A. 1963, Utah State University; M.P.A. 1966, Ph.D. 1968, University of Southern California

Edmund Patrick Harper, *Visiting Assistant Professor of Physics*
B.S. 1965, University College, Dublin; M.S. 1969, Ph.D. 1972, Purdue University

Jerry Harvey, *Professor of Management Science*
B.B.A. 1957, Ph.D. 1963, University of Texas at Austin

Shahin Hashtroudi, *Assistant Professor of Psychology*
B.A. 1971, American University of Beirut; Ph.D. 1976, State University of New York at Stony Brook

Richard Catlin Haskett, *Professor of American History*
B.A. 1940, M.A. 1941, Indiana University; M.A. 1946, Ph.D. 1952, Princeton University

Gertrude Haugan, *Clinical Instructor in Art Therapy*
B.A. 1952, M.A. 1956, George Washington University; Ph.D. 1970, University of Maryland

Declan Charles Haun, *Associate Professorial Lecturer in Journalism*

Oli Havrylyshyn, *Associate Professor of Economics*
B.A. 1966, Queen's University, Canada; Ph.D. 1972, Massachusetts Institute of Technology

Donald Hawkins, *Professor of Human Kinetics and Leisure Studies and Research Professor of Medicine*
B.A. 1958, King's College, Pennsylvania; M.A. 1960, Lehigh University; Ed.D. 1967, New York University

Patrick Louis Hayes, *Associate Professorial Lecturer in Mathematics*
B.S. 1970, M.S. 1971, D.A. 1973, Carnegie-Mellon University

†Janet Craig Heddesheimer, *Associate Professor of Education*
B.A. 1965, Coe College; M.A. 1968, Ph.D. 1971, Ohio State University

John Helmer, *Associate Professor of Sociology*
B.A. 1956, University of Melbourne; M.A. 1960, Ph.D. 1972, Harvard University

Robert Helms, *Associate Professorial Lecturer in Economics*
B.S. 1962, Auburn University; M.A. 1966, Ph.D. 1975, University of California, Los Angeles

Jeffrey R. Henig, *Assistant Professor of Political Science*
B.A. 1970, Cornell University; Ph.D. 1977, Northwestern University

‡Dagmar Renate Kirshner Henney, *Associate Professor of Mathematics*
B.S. 1954, M.S. 1956, University of Miami; Ph.D. 1964, University of Maryland

Charles Joseph Herber, *Associate Professor of European History*
B.A. 1952, Dickinson College; M.A. 1957, Ph.D. 1965, University of California, Berkeley

Gilbert Richard Herer, *Professorial Lecturer in Speech and Professor of Child Health and Development*
B.S. 1953, M.S. 1954, Syracuse University; Ph.D. 1964, Northwestern University

*On sabbatical leave academic year 1979-80.
†On sabbatical leave spring semester 1980.
‡On leave of absence spring semester 1980.

Roy Hertz, *Research Professor of Pharmacology and of Obstetrics and Gynecology*
B.A. 1930, Ph.D. 1933, M.D. 1939, University of Wisconsin; M.P.H. 1940, Johns Hopkins University

Susan Hertz, *Associate Professorial Lecturer in Anthropology*
B.A. 1968, Stanford University; M.A. 1969, Ph.D. 1974, University of Minnesota

Julia Elizabeth Hicks, *Assistant Professor of Spanish*
B.A. 1946, M.A. 1947, University of Tennessee, Knoxville

Philip Henry Highfill, Jr., *Professor of English*
B.A. 1942, Wake Forest University; M.A. 1948, Ph.D. 1950, University of North Carolina

Peter Proal Hill, *Professor of History*
B.A. 1949, Tufts University; M.A. 1954, Boston University; Ph.D. 1966, George Washington University

Ronald Paul Hill, *Adjunct Instructor in Business Administration*
B.S. 1976, University of Maryland

James William Hillis, *Professor of Speech; Director, Speech Pathology and Audiology*
B.S. 1952, University of Nebraska; M.A. 1957, University of Maryland; Ph.D. 1963, Ohio State University

Joseph Hilmy, *Professorial Lecturer in Accounting*
B.Com. 1947, M.S. 1954, Ph.D. 1959, University of Aberdeen

Alfred John Hiltebeitel, *Associate Professor of Religion*
B.A. 1963, Haverford College; M.A. 1966, Ph.D. 1973, University of Chicago

Harold Clendenin Hinton, *Professor of Political Science and International Affairs*
B.A. 1946, M.A. 1948, Ph.D. 1951, Harvard University

Harold Lester Hirsh, *Professorial Lecturer in Health Care Administration*
M.D. 1942, Georgetown University; J.D. 1972, American University

Denis Michael Hitchcock, *Assistant Professor of Art*
B.A. 1967, University of California, Los Angeles; M.F.A. 1970, Ph.D. 1977, Princeton University

Herman Hedberg Hobbs, *Professor of Physics*
B.S. 1953, M.S. 1955, George Washington University; Ph.D. 1958, University of Virginia

Robert Lee Holland, *Associate Professor of Management Science; Dean of the College of General Studies*
B.S. 1951, M.S. 1956, University of Tennessee, Knoxville; Ph.D. 1960, Texas A&M University

Bruce Holly, Jr., *Clinical Instructor in Art Therapy*
B.A. 1971, University of Notre Dame; M.A. 1975, George Washington University

Mary Alida Holman, *Professor of Economics*
B.A. 1955, M.A. 1957, Ph.D. 1963, George Washington University

Robert William Holmstrom, *Associate Professor of Psychology*
B.A. 1956, Trinity College, Connecticut; Ph.D. 1965, Duke University

William Duane Hope, *Adjunct Associate Professor of Biological Sciences*
B.S. 1957, M.S. 1960, Colorado State University; Ph.D. 1964, University of California, Davis

Grace Brewster Murray Hopper, *Professorial Lecturer in Management Science*
B.A. 1928, Vassar College; M.A. 1930, Ph.D. 1934, Yale University

Gloria Lyon Horrworth, *Associate Professor of Education*
B.A. 1952, California State University, Los Angeles; M.A. 1961, California State University, Northridge; Ed.D. 1972, American University

James O. Horton, *Associate Professor of American History and Civilization*
B.A. 1965, State University of New York at Buffalo; M.A. 1970, University of Hawaii; **Ph.D. 1973, Brandeis University**

Sue Ann Robinson Hoth, *Lecturer in Education*
B.A. 1968, University of New Hampshire; M.A. 1971, Columbia University

Nicholas Hotton, *Professorial Lecturer in Geology*
B.S. 1947, Ph.D. 1950, University of Chicago

Lawrence Houstoun, Jr., *Assistant Professorial Lecturer in Human Kinetics and Leisure Studies*
B.A. 1952, Lafayette College

Edmund G. Howe, *Associate Professorial Lecturer in Forensic Sciences*
B.A. 1966, Yale University; M.D. 1970, Columbia University; J.D. 1976, Catholic University of America

Thomas Richard Howie, *Associate Professorial Lecturer in Education*
B.S. 1964, Frostburg State College; M.Ed. 1967, University of Maryland; Ed.D. 1972, George Washington University

Ching-Yao Hsieh, *Professor of Economics*
B.A. 1939, St. John's University, China; M.A. 1958, Ph.D. 1964, George Washington University

Kun-yen Huang, *Professor of Microbiology*
M.D. 1969, National Taiwan University; Ph.D. 1987, George Washington University

Houlder Howard Hudgins, Jr., *Assistant Professorial Lecturer in Art*
B.S. 1970, Virginia Commonwealth University; M.F.A. 1972, George Washington University

Maxwell White Hudgins, Jr., *Assistant Professorial Lecturer in Business Administration*
B.S. 1965, Ph.D. 1973, University of Virginia

Terry Lee Hufford, *Associate Professor of Botany*
B.S. 1961, M.A. 1962, Bowling Green State University; Ph.D. 1972, Ohio State University

Rudolph Hugh, *Professor of Microbiology*
B.S. 1940, Michigan State University; Ph.D. 1944, Loyola University of Chicago

Thomas Louis Hughes, *Assistant Professorial Lecturer in Geology*
B.S. 1958, University of Oklahoma

Edwin Lee Hullander, *Visiting Associate Professor of Business Administration*
B.S. 1960, Tennessee Technological University; M.S. 1965, M.S. 1971, Ph.D. 1972, Iowa State University

John Paul Hume, *Assistant Professorial Lecturer in Forensic Sciences*
B.B.A. 1964, University of Notre Dame; J.D. 1970, George Washington University

Robert Lee Humphrey, Jr., *Professor of Anthropology*
B.A. 1962, American University; Ph.D. 1970, University of New Mexico

Gerard Paul Huvé, *Assistant Professor of French*
B.A. 1963, American University; M.A. 1969, University of Maryland

Robert Nicholas Iannacone, *Assistant Professor of Special Education*
B.S. 1966, M.S. 1971, West Chester University of New York at Buffalo; Ph.D. 1976, University of Florida

C. Terrence Ireland, *Associate Professor of Statistics*
B.A. 1960, Central University; Ph.D. 1967, George Washington University

Norman Murray Irvine, *Studio Lecturer in Applied Music (Brass)*
B.S. in Mus.Ed. 1965, M.M. in Mus.Ed. 1967, University of Maryland

Rita Klein Ives, *Professor of Special Education*
B.A. 1958, University of Pittsburgh; M.A. in Ed. 1967, Ed.S. 1967, Ed.D. 1971, George Washington University

David Iwamoto, *Professorial Lecturer in Education*
A.B. 1957, Whitman College; M.A. 1958, Columbia University; M.A. in Ed. 1962, Ed.D. 1963, George Washington University

Michael John Jackson, *Professor of Physiology*
B.Sc. 1963, University of London; Ph.D. 1966, Sheffield University

Evelyn J. Jacob, *Associate Professorial Lecturer in Anthropology*
B.A. 1971, Ohio [illegible]; M.A. 1973, Ph.D. 1977, University of Pennsylvania

David Bryant Jacobson, *Associate Clinical Professor of Obstetrics and Gynecology*
B.A. 1956, University of Utah; M.D. 1961, George Washington University

[illegible] Bravman Jacobson, *Assistant Professor of Speech*
B.A. 1970, Northeastern University; M.F.A. 1974, Boston University

N. Richard Janis, *Assistant Professorial Lecturer in Forensic Sciences*
B.A. 1968, University of Wisconsin; J.D. 1972, Harvard University

Dorothy Coy Jarvinen, *Studio Lecturer in Applied Music (Cello)*
Diploma 1939, Institute of Musical Art

Alvin Carl Jensen, *Professorial Lecturer in Education; Associate Dean of College of General Studies*
[illegible] University of Wisconsin-Whitewater; M.A. in Ed. 1960, Ed.D. 1967, George Washington University

Diana Entwisle Johnson, *Assistant Professor of Biology*
B.A. 1970, Cornell College; Ph.D. 1975, University of Chicago

Kurt Edward Johnson, *Associate Professor of Anatomy*
B.S. 1965, Johns Hopkins University; M.Phil. 1969, Ph.D. 1970, Yale University

Nancy Diers Johnson, *Assistant Professor of Human Kinetics and Leisure Studies*
B.S. 1955, University of Minnesota; M.A. 1966, University of Iowa

Thomas Nick Johnson, *Professor of Anatomy*
[illegible] St. Ambrose College; M.S. 1961, Michigan State University; Ph.D. 1963, University of Michigan

William Read Johnson, *Associate Professor of History*
B.A. 1951, Oberlin College; M.A. 1955, Ph.D. 1961, University of Washington

Johannah J. Jones, *Assistant Professor of Business Administration*
[illegible] B.A. [illegible] New York University; M.B.A. 1974, American University at Montgomery

Meredith Leam Jones, *Adjunct Professor of Ecological Sciences*
B.A. 1948, M.A. 1952, Ph.D. 1956, University of California, Berkeley

Robert Gean Jones, *Professor of Religion; University Marshal*
B.A. 1947, Baylor University; B.D. 1950, M.A. 1957, Ph.D. 1959, Yale University

Eva Scheyer Jospe, *Associate Professorial Lecturer in Religion*
M.A. 1963, Georgetown University

Hugo Dietrich Junghenn, *Professor of Mathematics*
[illegible] B.S. 1961, Albright College; M.A. 1963, Villanova University; Ph.D. 1971, George Washington University

Robert Konrad Kahn, *Professorial Lecturer in Psychology*
[illegible] B.A. 1950, University of Pennsylvania; M.A. 1951, George Washington University; Ph.D. 1957, Pennsylvania State University

Stephen Arnold Karp, *Associate Professor of Psychology*
[illegible] B.S. 1956, City University of New York, Brooklyn College; M.A. 1962, New School for Social Research; Ph.D. 1962, New York University

Kenneth Casper Kates, *Professorial Lecturer in Zoology*
B.A. 1952, Bard College; M.A. 1954, Ph.D. 1957, Duke University

Barbara Sylvia Katz, *Assistant Professorial Lecturer in Human Kinetics and Leisure Studies*
[illegible] B.S. in Ed. 1962, City University of New York, Brooklyn College; M.A. in Ed. 1966, George Washington University

Irving Katz, *Professor of Mathematics*
B.S. 1956, City University of New York, Brooklyn College; M.A. 1958, Ohio State University; Ph.D. 1964, University of Maryland

S. Stanley Katz, *Professorial Lecturer in Business Administration*
B.A. 1954, M.A. 1956, Syracuse University; Ph.D. 1966, American University

Nan Mattingly Kauer, *Lecturer in English*
B.A. 1972, Randolph-Macon College

Erle Galen Kauffman, *Adjunct Professor of Geology*
B.S. 1955, M.S. 1956, Ph.D. 1961, University of Michigan

Samuel Kavruck, *Visiting Professor of Education*
B.S. [illegible], M.S. in Ed. 1936, City University of New York, City College; M.A. in Govt. [illegible], Ed.D. 1954, George Washington University

Warren Joseph Keegan, *Professor of Business Administration*
[illegible] B.A. 1958, M.A. 1959, Syracuse University; M.B.A. 1960, D.B.A. [illegible], [illegible] University

Steven Keller, *Assistant Professor of Speech; Director of Forensics*
B.S. 1968, M.A. 1969, Ohio State University

James Patrick Kelly, *Assistant Professorial Lecturer in Business Administration*
B.A. 1967, University of Delaware; J.D. 1972, Harvard University

John Price Kelly, *Adjunct Instructor in Health Care Administration*
B.S. 1965, Prairie View Agricultural and Mechanical College; M.P.H. 1972, University of California

Margaret Fraser Kelso, *Lecturer in Education*
B.A. 1968, M.A. 1974, George Washington University

*John Whitefield Kendrick, *Professor of Economics*
B.A. 1936, M.A. 1938, University of North Carolina; Ph.D. 1946, George Washington University

Robert Emmet Kennedy, Jr., *Associate Professor of European History*
B.A. 1960, Johns Hopkins University; M.A. 1965, Boston College; Ph.D. 1973, Brandeis University

Richard Alec Kenney, *Professor of Physiology*
B.S. 1947, Ph.D. 1951, University of Birmingham

Robert Wayne Kenny, *Professor of History*
B.J. 1960, University of Texas at Austin; M.A. 1957, University of Minnesota; Ph.D. 1963, University of Chicago

Stephen Gabriel Kent, *Associate Professor of Pathology*
B.A. 1956, M.D. 1960, Case Western Reserve University

Hewitt Kenyon, *Professor of Mathematics*
B.S. 1941, Ph.D. 1947, University of California, Berkeley

Jackson Kelley Kern, *Adjunct Assistant Professor of Statistics*
B.A. 1969, University of Iowa; M.B.A. 1971, Columbia University

Margot Starr Kernan, *Adjunct Associate Professor of Speech*
B.A. 1949, Bennington College; M.A. 1966, San Francisco State University

James Michael Kerns, *Assistant Professor of Accounting*
B.A. 1966, St. Olaf College; M.S. 1968, Ph.D. 1972, Purdue University

Norayr Krikor Khatcherian, *Associate Professor of Physics*
B.S. 1960, M.A. 1962, George Washington University; Ph.D. 1966, University of Virginia

Sura Kang Kim, *Studio Lecturer in Applied Music (Piano)*
B.A. 1949, Ewha University, Seoul; M.M.E. 1955, Boston-Wellesley College; M.M. 1962, Manhattan School of Music

Young Kim, *Professor of Political Science and International Affairs*
M.A. 1956, B. Vanderbilt University; Ph.D. 1958, University of Pennsylvania

Jocelyn Dawn Kind, *Associate Professor of Microbiology and of Medicine*
B.A. 1956, Michigan State University; M.S. 1960, Ph.D. 1966, University of Michigan

James Cecil King, *Professor of German*
B.A. 1950, M.A. 1951, Ph.D. 1954, George Washington University

Michael King, *Associate Professor of Chemistry*
B.S. 1966, Illinois Institute of Technology; M.A. 1967, Ph.D. 1970, Harvard University

Margaret R. Kirkland, *Adjunct Instructor in English*
B.A. 1960, Mary Baldwin College; M.A. 1971, Georgetown University

Arthur David Kirsch, *Professor of Statistics and of Psychology*
B.A. 1950, George Washington University; M.S. 1952, Ph.D. 1957, Purdue University

Peter Randall Kiviat, *Professor of History*
B.A. 1960, Lawrence University; M.A. 1963, Ph.D. 1969, University of California, Los Angeles

Linda Gail Kleiman, *Adjunct Assistant Professor of Psychology*
B.S. 1964, University of Cincinnati; Ph.D. 1969, University of Hawaii

Philip Klebes, *Professor of Pharmacology*
B.S. 1956, City University of New York, Queens College; M.S. 1960, Ph.D. 1962, University of Minnesota

*On sabbatical leave academic year 1978-79

*Robert Earle Knowlton, *Associate Professor of Biology; Assistant P... of Columbian College of Arts and Sciences*
B.A. 1960, Bowdoin College; Ph.D. 1970, University of North Carolina

Maritta Koch-Weser, *Associate Professorial Lecturer in Anthropology*
Ph.D. 1975, Rheinische Friedrich Wilhelms Universitaet, Germany

Marilyn Jean Koering, *Professor of Anatomy*
B.A. 1960, College of St. Scholastica, M.S. 1963, Ph.D. 1967, University of Wisconsin

Jason David Kogan, *Associate Professorial Lecturer in Forensic Sciences*
B.A. 1966, Pennsylvania State University; J.D. 1969, George Washington University

Louis Sampson Kornicker, *Adjunct Professor of Biological Sciences*
B.S. 1941, B.S. 1942, University of Alabama; M.A. 1954, Ph.D. 1957, Columbia University

John Kraft, *Professorial Lecturer in Economics*
B.S. 1966, St. Bonaventure University; M.A. 1970, Ph.D. 1971, University of Pittsburgh

Robert Henry Kraft, *Studio Lecturer in Applied Music (Trombone & Recorder)*
Mus.B. 1960, Eastman School of Music

Edith Kramer, *Assistant Professorial Lecturer in Art Therapy*

Joan Krash, *Assistant Professorial Lecturer in Art Therapy*
B.A. 1966, George Washington University; M.A. 1974, Ph.D. 1975, American University

Kenneth Krell, *Adjunct Associate Professor of Genetics*
B.A. 1954, University of Pittsburgh; M.S. 1957, Ph.D. 1958, Columbia University

Gordon Fox Kreplin, *Studio Lecturer in Applied Music* (Guitar)
B.A. 1975, American University

Melmela Kreshover, *Clinical Instructor in Art Therapy*
B.A. 1972, M.A. 1974, George Washington University

Dean Krueger, *Research Professor of Statistics and of Ophthalmology*
B.A. 1938, M.A. 1942, University of Chicago; M.S. 1959, Columbia University

Ruth Marilyn Krulfeld, *Professor of Anthropology*
B.A. 1956, Brandeis University; Ph.D. 1974, Yale University

Edwin Paul Kulawiec, *Professor of Education*
B.A. [illegible], West Virginia; M.A. [illegible], Seton Hall University; M.A.T. [illegible], Indiana University; Ed.D. 1971, University of Wisconsin

Marquette Kulsey Kupet, *Studio Lecturer in Applied Music (Flute)*
B.M. 1971, New England Conservatory of Music

Frederick Charles Kurtz, *Professor of Accounting*
B.S. [illegible], [illegible] University of Virginia; M.B.A. 1949, University of Pennsylvania; C.P.A. 1952, State of Maryland

Hanna Yaxa Landsberg Kwiatkowska, *Adjunct Associate Professor of ... Therapy*
B.A. 1929, Academy of Fine Arts, Warsaw

Irene Kyriakopoulos, *Assistant Professorial Lecturer in Economics*
B.A. [illegible], University of Maryland; M.A. [illegible], [illegible], George Washington University

John Marion Lachin III, *Associate Research Professor of Statistics*
B.S. 1966, Tulane University of Louisiana; Sc.D. 1972, University of Pittsburgh

Melvin Paul Lader, *Assistant Professor of Art*
B.A. 1969, M.A. 1973, State University of New York at Albany

Jerry Lee Lake, *Associate Professor of Photography*
B.F.A. [illegible], Virginia Commonwealth University; M.F.A. 1967, Ohio University

Carl James Lange, *Professor of Psychology; Vice President for Administration and Research*
B.S. 1945, Duke University; M.S. 1948, Ph.D. 1951, University of Pittsburgh

Larry D. Lankton, *Assistant Professorial Lecturer in American Civilization*
B.A. 1969, DePauw University; M.A. 1971, Ph.D. 1977, University of [illegible]

JoAnne Lanzarotta, *Adjunct Instructor in Anthropology*
B.A. 1967, University of Minnesota; M.A. 1971, George Washington University

* On sabbatical leave fall semester 19[illegible]

Nicholas Lappas, *Assistant Professor of Forensic Sciences*
B.A. 1964, Thiel College; M.S. 1973, Ph.D. 1975, Duquesne University

Mary Ann Larkin, *Lecturer in English*
B.A. 1967, Duquesne University; M.A. 1969, Saint Louis University

Geza Peter Lauter, *Professor of Business Administration*
B.A. 1954, Institute for Foreign Languages, Hungary; B.A. 1962, M.B.A. 1964, Ph.D. 1968, University of California, Los Angeles

Robert Alan Lavine, *Associate Professor of Physiology*
B.S. 1962, Ph.D. 1969, University of Chicago

Thelma Z. Lavine, *Elton Professor of Philosophy*
B.A. 1936, Radcliffe College; M.A. 1937, Ph.D. 1939, Harvard University

William Medley Lawbaugh, *Associate Professorial Lecturer in Journalism*
B.A. 1967, M.A. 1969, St. Louis University; Ph.D. 1976, University of Missouri

J. Kevin Lawler, *Assistant Professorial Lecturer in Urban and Regional Planning*
B.S. 1971, Michigan State University; M.C.P. 1973, Harvard University

Edward Pitt Lawson, *Assistant Professorial Lecturer in Art*
B.A. 1951, Bowdoin College; M.A. 1955, New York University

Thomas Lawton, *Associate Professorial Lecturer in Chinese*
B.S. 1953, Durfee Technical Institute; M.F.A. 1959, University of Iowa; Ph.D. 1970, Harvard University

William Matthew Leach, *Adjunct Professor of Genetics*
B.A. 1956, Berea College; M.S. 1962, Ph.D. 1965, University of Tennessee, Knoxville

Linda Jane Lear, *Adjunct Associate Professor of History; Assistant Director, Division of Experimental Programs*
B.A. 1962, Connecticut College; M.A. 1964, Columbia University; Ph.D. 1974, George Washington University

*Hugh Linus LeBlanc, *Professor of Political Science and Public Affairs; Director, Programs in Public Affairs*
B.A. 1948, Louisiana State University and Agricultural and Mechanical College; M.A. 1950, University of Tennessee, Knoxville; Ph.D. 1958, University of Chicago

Ann Lee, *Studio Lecturer in Applied Music (Voice)*
B.A. 1955, Seoul National University College of Music; Mus.M. 1959, New England Conservatory of Music

Davis Lin-chuan Lee, *Assistant Professor of Chinese*
B.S. 1957, Chung-Hsing University, Taiwan; M.S. 1969, University of Minnesota; Ph.D. 1979, Georgetown University

Lawrence Allen Lee, *Assistant Professorial Lecturer in Mathematics*
B.S. 1964, Virginia Polytechnic Institute and State University; M.S. 1966, Ph.D. 1976, George Washington University

Myrna Pike Lee, *Associate Professor of Mathematics*
B.A. 1957, Cornell University; M.S. 1959, Ph.D. 1962, University of Illinois

Donald Richard Lehman, *Associate Professor of Physics*
B.S. 1962, Rutgers, The State University; M.S. 1964, Air Force Institute of Technology; Ph.D. 1970, George Washington University

Patricia Hilary Madoo Lengermann, *Professor of Sociology*
B.A. 1963, Oxford University; M.A. 1966, Ph.D. 1969, Cornell University

Fred Charles Leone, *Professorial Lecturer in Statistics*
B.A. 1942, Manhattan College; M.S. 1943, Georgetown University; Ph.D. 1949, Purdue University

Edwin Milton Lerner II, *Research Professor of Microbiology*
B.A. 1941, M.D. 1944, Harvard University

Karen Lee Levenback, *Lecturer in English*
B.A. 1972, State University of New York at Stony Brook; M.A. 1978, Georgetown University

Nat Levitan, *Professor of Economics*
B.S.S. 1937, City University of New York, City College; M.A. 1939, Ph.D. 1949, Columbia University

*On sabbatical leave fall semester 1979.

Bernard Isaac Levy, *Professor of Psychology*
B.A. 1948, New York University; Ph.D. 1952, University of Rochester

*Joseph Benjamin Levy, *Professor of Chemistry*
B.S. 1943, University of New Hampshire; M.S. 1945, Ph.D. 1948, Harvard University

Edwin Joseph Baughman Lewis, *Professor of Accounting*
B.A. 1938, University of Western Ontario; M.B.A. 1939, Northwestern University

John Frederick Lewis, *Professor of Geology*
B.S. 1959, M.S. 1960, Victoria University of Wellington, New Zealand; D.Phil. 1964, Ox... University

Ralph Kepler Lewis, *Professor of Anthropology*
B.A. 1944, Southwest Missouri State College; M.A. 1939, University of Southern Califor... Ph.D. 1967, Columbia University

William H. Lewis, *Adjunct Professor of International Affairs and Po... litical Science*
B.A. 1951, M.A. 1953, George Washington University; Ph.D. 1960, American University

Hubert Whitman Lilliefors, *Professor of Statistics*
B.A. 1952, Ph.D. 1964, George Washington University; M.A. 1953, Michigan State Univers...

S. Donna Lind, *Visiting Assistant Professor of Health Care Administration*
B.S. 1971, Portland State University; Ph.D. 1976, Brandeis University

David Lawrence Lindauer, *Visiting Assistant Professor of Economics*
B.S. 1973, City University of New York, City College; M.A. 1976, Harvard University

Carl Arne Linden, *Associate Professor of International Affairs and Po... litical Science*
B.A. 1951, Syracuse University; M.A. 1956, Harvard University; Ph.D. 1966, George Washi... ton University

Roy Charles Lindholm, *Professor of Geology*
B.S. 1959, University of Michigan; M.A. 1963, University of Texas at Austin; Ph.D. 1967, John... Hopkins University

Craig William Linebaugh, *Associate Professor of Speech*
B.A. 1970, Lebanon Valley College; M.A. 1974, Ph.D. 1978, Temple University

*Donald Linkowski, *Professor of Education*
B.A. 1961, M.S. 1963, Ph.D. 1969, State University of New York at Buffalo

Calvin Darlington Linton, *Professor of English; Dean of Columbian Col... of Arts and Sciences*
B.A. 1935, George Washington University; M.A. 1939, Ph.D. 1940, Johns Hopkins Univers...

Lewis Lipnick, *Studio Lecturer in Applied Music (Bassoon and Recorder)*
Mus.B. 1966, Peabody Institute of Baltimore

Gordon Leslie Lippitt, *Professor of Behavioral Sciences*
B.S. 1942, Litt.D. 1971, Springfield College; B.D. 1946, Yale University; M.A. 1947, Univers... of Nebraska; Ph.D. 1959, American University

Thomas Phillip George Liverman, *Professor of Mathematics and Adjun... Professor of Engineering and Applied Science*
B.A. 1941, University of Montpellier; M.A. 1948, Ph.D. 1956, University of Pennsylvania

John Lobuts, Jr., *Adjunct Associate Professor of Management Science; Assistant Dean of the School of Government and Business Administra... tion*
B.S. 1957, Fairmont State College; M.A. in Ed. 1965, Ed.D. 1970, George Washington Uni... versity

Norma Maine Loeser, *Professor of Business Administration; Dean of the School of Government and Business Administration*
B.A. 1958, M.B.A. 1967, D.B.A. 1971, George Washington University

John Mortimer Logsdon, *Associate Professor of Public Affairs and Polic... Science*
B.S. 1960, Xavier University, Ohio; Ph.D. 1970, New York University

* On sabbatical leave spring semester 1980.

John Frederick Long, *Assistant Professorial Lecturer in Geography*
B.S. 1967, Georgia Institute of Technology; M.A. 1970, Ph.D. 1974, University of North Carolina

William Francis Edward Long, *Professor of Economics; Dean of the Summer Sessions*
B.A. 1946, M.A. 1947, Ph.D. 1957, George Washington University

Benjamin David Lourie, *Assistant Professorial Lecturer in Art*
B.A. 1971, Earlham College

John Carl Lowe, *Professor of Geography and Regional Science*
B.A. 1956, M.A. 1960, George Washington University; Ph.D. 1969, Clark University

Gregory Ludlow, *Associate Professor of French*
Licence es Lettres 1962, University of Paris; Ph.D. 1970, McGill University, Canada

Robert Alfred Luke, Jr., *Visiting Assistant Professor of Education*
B.A. 1963, Colgate University; M.A. 1965, Ph.D. 1971, University of Maryland

Wendy Pai Lyle, *Lecturer in Chinese*
B.A. 1971, Tamkang College of Letters and Science; M.A. 1976, University of Wisconsin

Dorcas Joanne Lynn, *Clinical Instructor in Medicine and Faculty Associate for Humanities and Medicine*
B.S. 1970, Dickinson College, M.D. 1974, Boston University

James Lawrence Lyons, *Assistant Professorial Lecturer in Forensic Sciences*
B.A. 1962, Wheeling College, J.D. 1967, Georgetown University

James Hunt Maddox, *Associate Professor of English*
B.A. 1965, Princeton University, M.A. 1967, Ph.D. 1969, Yale University

James Mahoney, Jr., *Associate Professorial Lecturer in Anthropology and American Civilization*
B.F.A. 1968, Philadelphia College of Art

Wendy Maiorana, *Lecturer in Art Therapy*
B.A. 1961, American University; M.A. 1976, George Washington University

Paul Bernard Malone III, *Visiting Associate Professor of Business Administration*
B.S. 1952, U.S. Military Academy; M.S. in Per.Ad. 1960, D.B.A. 1973, George Washington University

William Everett Maloney, *Associate Professorial Lecturer in Geology*
B.S. 1950, M.S. 1951, George Washington University

Harold George Mandel, *Professor of Pharmacology*
B.S. 1944, Ph.D. 1949, Yale University

Wallace Harper Mann, *Studio Lecturer in Applied Music (Flute)*
Mus.B. 1943, Eastman School of Music

Raymond Manning, *Adjunct Professor of Biological Sciences*
B.A. 1956, M.S. 1959, Ph.D. 1963, University of Miami

Nathan Mantel, *Research Professor of Statistics*
B.S. 1939, City University of New York, City College, M.A. 1956, American University

Edward Marasciulo, *Associate Professorial Lecturer in Geography*
B.A. 1950, University of Miami

Joseph Bernard Margolin, *Adjunct Professor of Psychology*
B.A. 1942, City University of New York, Brooklyn College; M.A. 1947, George Washington University; Ph.D. 1954, New York University

Anthony Marinaccio, *Professor of Education*
Ed.B. 1937, Central Connecticut State College, M.A. 1939, Ohio State University; Ph.D. 1949, Yale University; LL.D 1961, Parsons College

Howard Wight Marshall, *Assistant Professorial Lecturer in American Civilization*
B.A. 1970, University of Missouri; M.A. 1972, Ph.D. 1976, Indiana University

Ann Gardner Martin, *Lecturer in German*
B.A. 1969, Oberlin College, M.A. 1976, Oxford University

On sabbatical leave fall semester 1979

John Sawyer Martin, Jr., *Studio Lecturer in Applied Music (Cello)*

Shelley Ellen Smith Mastran, *Assistant Professorial Lecturer in Geography and Regional Science*
B.A. 1965, Vassar College; M.A. 1974, George Washington University

Anthony James Mastro, *Professor of Accounting*
B.S. 1951, M.B.A. 1953, New York University; M.A. 1963, University of Notre Dame; C.P.A. 1955, State of New Jersey

Paul Mazel, *Professor of Pharmacology and of Anesthesiology*
B.S. 1958, Medical College of Virginia Commonwealth University; M.S. 1960, Trinity University; Ph.D. 1960, Vanderbilt University

Amy Jo Mazur, *Assistant Research Professor of Special Education*
B.A. 1971, M.A. 1974, Ed.D. 1977, George Washington University

Guido Ettore Mazzeo, *Professor of Romance Languages*
B.A. 1925, City University of New York, City College; M.A. 1938, Ph.D. 1961, Columbia University

David McAleavey, *Assistant Professor of English*
B.A. 1968, M.F.A. 1972, Ph.D. 1975, Cornell University

John Francis McCarthy, Jr., *Associate Professor of Business Administration*
B.A. 1936, Duquesne University; M.L. 1955, University of Pittsburgh

Cynthia McClintock, *Assistant Professor of Political Science*
B.A. 1967, Harvard University; M.A. 1969, University of California, Los Angeles; Ph.D. 1975, Massachusetts Institute of Technology

Linda Lyon McCloud, *Lecturer in English*
B.A. 1963, M.A. 1978, San Francisco State University

Kenneth Frederick McClure, *Professorial Lecturer in Commercial Law*
B.S. 1941, M.S. 1943, Wichita State University; LL.B. 1941, University of Maryland

Kathy G. McCort, *Lecturer in Human Kinetics and Leisure Studies*

Lynn Elaine McDevitt, *Lecturer in Human Kinetics and Leisure Studies*

*James Kenneth McDonald, *Associate Professor of International Affairs*
B.A. 1954, Yale University; B.Litt. 1961, D.Phil. 1975, Oxford University

Stephen E. McGaughey, *Associate Professorial Lecturer in Economics*
B.A. 1967, Southwest Missouri State College; M.S. 1968, Ph.D. 1974, Iowa State University

John Patrick McGill, *Associate Professorial Lecturer in Journalism*
B.S. 1967, Georgetown University

Dorn Charles McGrath, Jr., *Professor of Urban Planning*
B.A. 1954, Dartmouth College; M.C.P. 1956, Harvard University

Gerald Joseph McHugh, *Associate Professor of Health Care Administration*
B.Comm. 1967, University of Nebraska at Omaha; M.B.A. 1969, D.B.A. 1974, George Washington University

Margaret McIntyre, *Professor of Education*
B.S. in Ed. 1941, State University of New York at Buffalo; M.A. 1944, Northwestern University; A.P.C. 1963, George Washington University

Cornelius Patrick McKelvey, *Instructor in Health Care Administration*
B.S. 1963, Philadelphia College of Pharmacy and Science; M.S. 1970, University of Maryland; M.A. in H.C.A. 1973, George Washington University

Francis Edward McLaughlin, *Professorial Lecturer in Business Administration*
B.S. 1960, University of New Mexico; J.D. 1966, American University

Marian McNabb, *Studio Lecturer in Applied Music (Piano and Organ)*
Mus.B. 1950, University of Kansas; M.S. in Mus. 1958, Union Theological Seminary

Robert Emil McNeil, *Associate Professorial Lecturer in Education*
B.S. 1954, West Chester State College; M.A. in Ed. 1961, Ed.D. 1968, George Washington University

Edward C. McReady, *Assistant Professorial Lecturer in Accounting*
B.S., B.A. 1964, Georgetown University; J.D. 1972, American University

* On leave of absence academic year 1979-80

Cornelius Glen McWright, *Adjunct Professor of Forensic Sciences and of Biological Sciences*
B.A. 1952, University of Evansville; M.S. 1965; Ph.D. 1970, George Washington University

John Latane Melnick, *Associate Professorial Lecturer in Forensic Sciences*
B.S. 1958, J.D. 1961, University of Virginia

Christine Foster Meloni, *Adjunct Instructor in English*
B.A. 1963, Wells College; M.A. 1964, Middlebury College

Kenneth Everett Melson, *Associate Professorial Lecturer in Forensic Sciences*
B.A. 1970, Denison University; J.D. 1973, George Washington University

Henry Merchant, *Associate Professor of Biology*
B.S. 1964, M.S. 1966, University of Maryland; Ph.D. 1970, Rutgers, The State University

Bernard Matthew Mergen, *Associate Professor of American Civilization*
B.A. 1959, University of Nevada; M.A. 1960, Ph.D. 1966, University of Pennsylvania

Astrid E. Merget, *Associate Professor of Public Administration*
B.A. 1967, Mount Holyoke College; M.P.A. 1968, Ph.D. 1975, Syracuse University

William Merrick, *Adjunct Associate Professor of Genetics*
B.S. 1965, Yale University; M.S. 1969, Ph.D. 1971, University of Georgia

Carl Ronald Merril, *Adjunct Assistant Professor of Genetics and Professorial Lecturer in Biochemistry*
B.S. 1958, College of William and Mary; M.D. 1962, Georgetown University

Anthony Louis Mescher, *Assistant Professor of Biology*
B.S. 1971, St. Joseph's College, Indiana; M.S. 1973, Ph.D. 1975, Ohio State University

Joseph Louis Metivier, Jr., *Professor of Romance Languages; Assistant Dean of Columbian College of Arts and Sciences*
B.A. 1951, M.A. 1955, George Washington University

Michael R. Metzger, *Assistant Professor of Economics*
B.S. 1972, M.A. 1974, University of Oklahoma; Ph.D. 1979, Stanford University

Michael Meyer, *Adjunct Assistant Professor of Health Care Administration*
B.S. 1971, University of Kentucky; M.H.A. 1974, Xavier University; M.S.M. 1975, Rollins College; D.P.A. 1978, Nova University

H. Emerson Meyers, *Professorial Lecturer in Music*

Jack William Millar, *Vivian Gill Professor of Epidemiology and Environmental Health*
B.A. 1945, Stanford University; M.D. 1947, George Washington University; M.P.H. 1951, M.S. in Hygiene and Tropical Medicine 1952, Harvard University

Charles Russell Miller, *Associate Professor of Business Administration; George Washington University Program (Tidewater Area Center), Hampton, Va.*
B.S. 1945, U.S. Naval Academy; M.B.A. 1957, Ph.D. 1966, University of California, Los Angeles

Frank Nelson Miller, Jr., *Professor of Pathology*
B.S. 1943, M.D. 1948, George Washington University

James Miller, *Professor of Psychology; Director of Graduate Training in Clinical Psychology*
B.A. 1958, J.D. 1962, Ph.D. 1966, Yale University

Lenore Donna Miller, *Curator, Dimock Gallery*
B.A. 1969, Goucher College; M.F.A. 1972, George Washington University

Lillian Miller, *Professorial Lecturer in Art and American Civilization*
B.S. 1943, Radcliffe College; M.A. 1948, Ph.D. 1962, Columbia University

Mary Fetler Miller, *Adjunct Assistant Professor of Russian*
B.A. 1943, Northwestern University; M.A. 1966, University of Michigan

Samuel Burdick Molina, *Assistant Professor of Art*
B.A. 1964, M.A. 1969, University of Wyoming

Clarence Cowan Mondale, *Professor of American Civilization*
B.A. 1947, Macalester College; M.A. 1954, Ph.D. 1960, University of Minnesota

John Edward Montgomery, *Adjunct Assistant Professor of Health C[are] Administration*
B.A. [illegible] Brigham Young University; M.H.A. 1962, University of Minnesota; M.S. 1975, [illegible] versity of California, Berkeley

Karen Montgomery, *Assistant Professorial Lecturer in Art*
B.S. 1957, University of Maryland; M.F.A. 1976, George Washington University

Dorothy Adele Moore, *Professor of Education*
B.A. 1944, University of Maryland; M.A. 1950, A.P.C. 1964, Ed.D. 1970, American Univ[ersity]

John Andrew Morgan, Jr., *Professor of Political Science and Public Affa[irs]*
B.A. 1957, Stetson University; M.A. 1959, Ph.D. 1963, Duke University

John Morrell, Jr., *Assistant Professorial Lecturer in Art*
B.S. 1973, Georgetown University

Andrea Helen Morris, *Research Instructor in Human Kinetics and Lei[sure] Studies*
B.S. 1974, M.A. 1978, University of Maryland

Glenn Ellis Morris, *Associate Professorial Lecturer in Psychiatry and B[ehavioral] Sciences [Allied Health] and in Health Care Administration*
B.S. 1963, M.A. 1969, University of Illinois; M.S. in H.A. 1956, Northwestern University

Mabel Elizabeth Inco Morris, *Associate Professorial Lecturer in Mathematics*
B.A. 1923, University of Evansville; M.A. 1928, University of Chicago

Margaret Morrison, *Assistant Professorial Lecturer in English*
B.A. 1969, M.A. 1972, Ph.D. 1977, George Washington University

Dixie Ann Michels Morse, *Lecturer in English*
B.A. 1970, Stanford University

James Norman Mosel, *Professor of Psychology*
B.A. 1940, Colgate University; M.A. 1941, Columbia University

Charles Arthur Moser, *Professor of Slavic*
B.A. 1956, Yale University; M.A. 1958, Ph.D. 1962, Columbia University

Yael M. Moses, *Assistant Professorial Lecturer in Hebrew*
B.S. 1965, Temple University; M.S. 1975, Towson State University

Wynne Walker Moskop, *Lecturer in Political Science*
B.A. 1971, Dickinson University; M.A. 1973, George Washington University

Ronald Raymond Mueller, *Associate Professorial Lecturer in Journalism*
B.S. 1969, U.S. Naval Academy

Robert Phillip Multhauf, *Adjunct Professor of History*
B.S. 1948, Iowa State University of Science and Technology; M.A. 1950, Ph.D. 1953, Univ[ersity] of California, Berkeley

Joseph Patrick Murphy, *Professorial Lecturer in Business Administration*
B.A. 1949, LL.B. 1950, LL.M. 1952, George Washington University

Philip Anthony Musgrave, *Associate Professorial Lecturer in Economics*
B.A. 1962, Haverford College; M.P.A. 1964, Princeton University; Ph.D. 1974, Massachusetts Institute of Technology

Jerold B. Muskin, *Assistant Professorial Lecturer in Economics*
B.A. 1969, [illegible] University; M.B.A. 1971, Northwestern University; Ph.D. 1976, [illegible] University

Leonard Nadler, *Professor of Education*
B.B.A. 1948, M.S. 1950, City University of New York, City College; Ed.D. 1962, Columbia University

Honey Nashman, *Assistant Professor of Human Kinetics and Leisure Studies, Director of the Office of Laboratory Experience, School of Education and Human Development*
B.S. 1956, New York University; M.S. 1957, Smith College

Nadine Nadeshda Natov, *Professor of Russian*
M.A. [illegible] Moscow Pedagogical Institute of Modern Languages, Soviet Union; Ph.D. 1973, University of Michigan

*Henry Richard Nau, *Associate Professor of Political Science and International Affairs*
B.S. 1963, Massachusetts Institute of Technology; M.A. 1967, Ph.D. 1972, Johns Hopkins University

Salih Nur Neftci, *Assistant Professor of Economics*
B.A. 1970, Middle East Technical University, Turkey; Ph.D. 1976, University of Minnesota

Anna Louise Kasten Nelson, *Adjunct Associate Professor of History*
B.A. 1961, M.A. 1963, University of Oklahoma; Ph.D. 1973, George Washington University

David Nelson, *Professor of Mathematics*
B.A. 1959, M.A. 1960, Ph.D. 1966, University of Wisconsin

Paul Delay Nelson, *Adjunct Professor of Health Care Administration*
B.A. 1964, [illegible] University, M.A. 1966, Ph.D. 1971, University of Georgia

Judith Nassbaum Neri, *Assistant Professorial Lecturer in Italian and in English*
B.A. 1962, Antioch College; M.A. 1965, University of Chicago; Ph.D. 1969, University of Maryland

Bjorn Karsten Netland, *Adjunct Assistant Professor of German, Assistant Dean of the Division of University Students*
B.A. 1971, M.A. 1973, George Washington University

Donald Lee Neugebauer, *Lecturer in Biological Sciences*
B.A. 1964, M.S. 1967, University of South Dakota; Ph.D. 1975, George Washington University

Benjamin Nimer, *Professor of Political Science and International Affairs*
B.A. 1942, Ph.D. 1953, University of Chicago

James Noel, *Adjunct Assistant Professor of Education and Assistant Dean of the College of General Studies*
B.A. 1966, M.A. 1969, Central Michigan University; Ed.D. 1972, North Carolina State University

Robert Anthony Norris, *Studio Lecturer in Applied Music (Guitar)*

Mary Elizabeth Norton, *Associate Professorial Lecturer in Classics*
B.A. 1935, M.A. 1938, University of Michigan

Harriet Novakovich, *Assistant Professorial Lecturer in Special Education*
B.S. 1957, M.S. 1958, Southern Illinois University

John Warren Nystrom, *Professorial Lecturer in Geography and Regional Science*
B.A. 1966, M.A. 1967, Ph.D. 1972, Clark University

Stephen O'Brien, *Adjunct Professor of Genetics*
B.S. 1965, St. Francis College; Ph.D. 1971, Cornell University

Thomas O'Connor, *Professorial Lecturer in Management Science*
B.S. 1947, U.S. Naval Academy; M.B.A. 1956, Harvard University; Ph.D. 1965, Stanford University

Robert Stewart Odmark, *Studio Lecturer in Applied Music (French Horn)*
B.M. 1969, University of Michigan; M.M. 1972, Catholic University of America

Norman Gabriel Oglesby, *Adjunct Assistant Professor of Health Care Administration*
B.Gen.Std. 1950, M.B.A. 1971, George Washington University; Ph.D. 1977, University of Georgia

George Andrew Olkhovsky, *Associate Professor of Russian*
B.A. 1965, M.A. 1967, University of Minnesota; Ph.D. 1969, Georgetown University

Charles O'Rear, *Professor of Forensic Sciences*
B.S. 1957, Virginia Polytechnic Institute and State University; M.S. 1961, M.C. 1964, University of Richmond; Ph.D. 1970, Medical College of Virginia of Virginia Commonwealth University

Marc Orenstein, *Assistant Professor of Pathology*
B.A. 1969, Johns Hopkins University; Ph.D. 1969, M.D. 1971, State University of New York Downstate Medical Center

*On medical leave academic year 1979-80.

Greg Michael Orfalea, *Lecturer in English*
B.A. 19[illegible] [illegible] University; M.F.A. 19[illegible] University of Alaska

Ruth Helm Osborn, *Associate Professorial Lecturer in Women's St[illegible]; Assistant Dean for Continuing Education for Women of the Colle[illegible]*
General Studies
B.S. 1940, University of Minnesota; M.A. in Ed. 1946, Ed.D. 1963, George Washington U[illegible] versity

Dennis A. O'Toole, *Associate Professorial Lecturer in American Civiliz[illegible] tion*
B.A. 19[illegible] Princeton University; M.A.T. 1965, Harvard University; Ph.D. 1974, Brown U[illegible] **versity**

Türker Ozdogan, *Assistant Professor of Ceramics*
Diploma 19[illegible], School of Applied Fine Arts, Turkey; M.F.A. 1972, George Washington U[illegible] **versity**

Harry P. Pachon, *Associate Professorial Lecturer in Public Administra[illegible]*
B.A. 196[illegible]; M.A. 1969, California State University, Los Angeles; Ph.D. 1974, Claremont Gra[illegible] **School**

Randall Kent Packer, *Associate Professor of Biology*
B.S. 196[illegible], Lock Haven State College; Ph.D. 1974, Pennsylvania State University

Harry Robert Page, *Professor of Business Administration*
B.A. 1941, Michigan State University; M.B.A. 1950, Harvard University; Ph.D. 1966, Ver[illegible] **University**

Chei-Min Paik, *Professor of Accounting and Quantitative Methods*
B.B.A. 19[illegible], University of Minnesota; M.B.A. 1960, University of California, Los Ang[illegible] **D.B.A. 1963, Harvard University**

Howard Erwin Paine, *Professorial Lecturer in Journalism*
B.A. 1950, American International College

Phyllis Marynick Palmer, *Adjunct Assistant Professor of Women's St[illegible] and of American Civilization*
B.A. 19[illegible], Hillcrest College; M.A. 1967, Ph.D. 1974, [illegible] University

Salvatore Rocco Paratore, *Associate Professor of Education; Assi[illegible] Dean of the Summer Sessions*
B.A. 1957, Colgate University; M.S. 1967, Yeshiva University; Ph.D. 1975, Syracuse U[illegible]

David Charles Park, *Research Instructor in Human Kinetics and Leis[illegible] Studies*
B.A. 1963, University of Kentucky; M.S. 1967, University of North Carolina

William Carleton Parke, *Associate Professor of Phys[illegible]*
B.S. 19[illegible], [illegible] College; [illegible] University

William Axel Parker, *Associate Professorial Lecturer in Hea[illegible] Administration*
B.S. 1945, University of Illinois; M.P.H. 1950, University of California, Berkeley; [illegible]
[illegible] Washington University

Richard Parnas, *Studio Lecturer in Applied Music (Violin and Viol[illegible]*

Robert Perris, *Professor of Music*
B.S. in Mus.Ed. 1945, M.S. in Mus.Ed. 1946, University of Pennsylvania; B.S. in Mus[illegible] 1948, Juilliard School of Mus[illegible]

Gail Paster, *Assistant Professor of English*
B.A. 1966, Smith College; M.Phil. 1970, Ph.D. 1974, Yale University

Donald Clark Paup, *Adjunct Professor of Human Kinetics and Le[illegible] Studies*
B.A. 19[illegible], [illegible] College; M.S. 1966, Ph.D. 1970, Temple University

David Leo Pawson, *Adjunct Associate Professor of Biological Scien[illegible]*
B.S. 19[illegible], M.S. 1961, Ph.D. 1965, Victoria University, New Zealand

John N. Pearce, *Adjunct Associate Professor of Urban Planning; American Civilization*
B.A. 1956, Yale University; M.A. 1959, University of Delaware

* On sabbatical leave spring semester 1980

Eldor Olin Pederson, *Associate Professor of Geography and Regional Science*
B.A. 1966, University of Washington; C.Phil. 1969, Ph.D. 1974, University of California, Berkeley

Lynn Sullivan Pena, *Adjunct Assistant Professor of English*
B.A. 1974, Brown University; M.S. 1975, Georgetown University

Thomas Paul Perazzoli, *Studio Lecturer in Applied Music (Flute)*

Malinee Peris, *Studio Lecturer in Applied Music (Piano)*
Licentiate 1946, 1947, Trinity College of Music, England; Licentiate 1950, Royal Academy of Music, England

Theodore Peter Perros, *Professor of Chemistry and of Forensic Sciences*
B.S. 1946, M.S. 1949, Ph.D. 1952, George Washington University

Elmer Bruce Peters, *Visiting Associate Professor of Management Science*
B.S. 1949, U.S. Military Academy; D.B.A. 1972, George Washington University

David Andreas Peterson, *Associate Professorial Lecturer in Business Administration*
B.A. 1964, Occidental College; J.D. 1967, M.B.A. 1968, George Washington University; M.P.A. 1974, Harvard University; Ph.D. 1975, Johns Hopkins University

Eric Alan Peterson, *Instructor in Political Science*
B.A. 1972, Pomona College; M.Phil. 1976, Yale University

Ruth Irene Peterson, *Associate Professor of Education*
B.S. 1947, State University of New York at Buffalo; M.S. 1948, Syracuse University; Ph.D. 1971, American University

John Charles Petricciani, *Adjunct Professor of Genetics and Professorial Lecturer in Biological Sciences*
B.S. 1956, Rensselaer Polytechnic Institute; M.S. 1960, University of Nevada, Reno; M.D. 1967, Stanford University

***Vladimir Petrov**, *Professor of International Affairs*
M.A. 1961, Ph.D. 1965, Yale University

J. Roger Peverley, *Visiting Assistant Professor of Physics*
B.A. 1960, M.A. 1964, Ph.D. 1964, Cambridge University

Marianne Ruth Phelps, *Assistant Professorial Lecturer in Education; Assistant Provost for Affirmative Action*
B.A. 1961, University of Michigan; M.S. 1964, M.A. 1965, University of Wisconsin; M.Phil. 1973, George Washington University

Ewing Lakin Phillips, *Professor of Psychology; Director, Counseling Center*
B.S. 1947, Central Missouri State College; M.A. 1948, University of Missouri; Ph.D. 1949, University of Minnesota

Richard L. Phipps, *Assistant Professorial Lecturer in Biological Sciences*
B.S. 1956, Eastern Illinois University; M.S. 1959, Ph.D. 1961, Ohio State University

Jack Warren Pierce, *Adjunct Professor of Geology*
B.S. 1949, M.S. 1950, University of Illinois; Ph.D. 1954, University of Kansas

Mordechai Pinkasovic, *Assistant Professorial Lecturer in Hebrew*
Licence 1971, Diplome d'Etudes Superieures 1972, University of Grenoble, France

Judith Ann Abrams Plotz, *Associate Professor of English*
B.A. 1960, Radcliffe College; B.A. 1962, M.A. 1966, Cambridge University; Ph.D. 1965, Harvard University

Herman Pollack, *Research Professor of International Affairs*
[illegible] 1949, City University of New York, City College; M.A.I.A. 1968, George Washington University

David Pollock, *Visiting Assistant Professor of Political Science*
B.A. 1972, Ph.D. 1979, Harvard University

Paul John Poppen, *Associate Professor of Psychology*
B.A. 1969, Central University of Iowa; Ph.D. 1973, Cornell University

David O. Porter, *Associate Professor of Public Administration*
B.S. 1963, M.A. 1966, University of Utah; Ph.D. 1970, Syracuse University

* Sabbatical leave fall semester 1979

Ben Posner, *Professorial Lecturer in Public Administration*
B.S. ... B.A. 19... [illegible] M.A. ... [illegible] Washington ... versity; Ph.D. 1962, American University

Francisco Prats, *Professor of Physics*
Licenciado en Ciencias Fisico 1946, University of Madrid, Ph.D. 1958, University of Maryl...

Stephen Henry Prussing, *Studio Lecturer in Applied Music (Voice); Director of Choral Groups*
B.A. 1945, Occidental College, Postgraduate Diploma 1948, Juilliard School of Music

Charles William Puffenbarger, *Professorial Lecturer in Journalism*
B.S. 1951, University of Maryland, M.A. 1964, George Washington University

Ralph Elliott Purcell, *Professor of Political Science*
B.A. 1940, Florida Southern College, M.A. 1941, Duke University; Ph.D. 1949, University ... Wisconsin

Olga L. Quintana, *Visiting Associate Professor of Health Care Administration*
B.S. 1970, University of Maryland; M.B.A. 1972, D.B.A. 1975, George Washington Univer...

Jon Alrik Quitslund, *Associate Professor of English*
B.A. 1961, Reed College; Ph.D. 1967, Princeton University

Sonya Antoinette Quitslund, *Assistant Professor of Religion*
B.A. 1958, Seattle University, M.A. 1964, Ph.D. 1967, Catholic University of America

Constance Adelaide Rachlin, *Studio Lecturer in Applied Music (Piano)*
Artist Diploma 1948, Curtis Institute of Music, Artist Diploma and Teacher's Certificate ... American Conservatory at Fontainbleau

Roland Cloyd Raffaelle, *Studio Lecturer in Applied Music (Guitar)*

David Ramaker, *Associate Professor of Chemistry*
B.S. 1965, University of Wisconsin—Milwaukee; M.S. 1968, Ph.D. 1971, University of Iowa

John Peter Ramo, *Studio Lecturer in Applied Music (Guitar)*
B.A. 1951, Long Island University, M.Ed. 1974, American University

Margaret Mary Hupp Ramsay, *Lecturer in Human Kinetics and Leisure Studies*
B.S. 1957, Purdue University, M.S. 1958, University of Wisconsin

Bernard Ramundo, *Professorial Lecturer in Law*
B.A. 1947, City University of New York, City College, LL.B. 1949, M.A. 1957, Columbia ... versity; Ph.D. 1966, American University

Martha Norman Rashid, *Professor of Education*
Ed.B. 1949, State University of New York, College at Geneseo; M.A. 1951, Ph.D. 1958, Uni... versity of Iowa

John Palmer Reesing, Jr., *Professor of English*
B.A. 1941, Baylor University, M.A. 1942, Tulane University; Ph.D. 1954, Harvard Univers...

Philip Norman Reeves, *Professor of Health Care Administration*
M.B.A. 1956, University of Chicago, D.B.A. 1970, George Washington University

Joan Roddy Regnell, *Associate Professor of Speech*
B.A. 1954, M.A. 1960, George Washington University

Harald Alfred Rehder, *Adjunct Professor of Biological Sciences*
B.A. 1929, Bowdoin College, M.A. 1933, Harvard University, Ph.D. 1934, George Wash... University

*Bernard Reich, *Professor of Political Science and International Affairs*
B.A. 1951, City University of New York, City College, M.A. 1963, Ph.D. 1964, Univers... Virginia

Melvin Reich, *Associate Professor of Microbiology*
B.S. 1953, City University of New York, City College, M.S. 1957, Ph.D. 1960, Rutg... State University

Frances Catherine Reid, *Adjunct Assistant Professor of English*
B.A. 1961, College of Notre Dame of Maryland, M.S. 1970, Georgetown University

Eugene J. Reiser, *Assistant Professorial Lecturer in Mathematics*
B.S. in E.E. 1961, University of Akron, Ph.D. 1970, University of Pittsburgh

* On sabbatical leave spring semester 1980.

William Martin Reynolds, *Professor of Speech*
B.A. 1950, Wichita State University; M.A. 1957, Ph.D. 1960, University of Florida

Raymond Patrick Rhinehart, *Assistant Professorial Lecturer in English*
B.A. 1962, Brown University; M.A. 1964, Ph.D. 1969, Princeton University

*Leo Paul Ribuffo, *Assistant Professor of History*
B.A. 1966, Rutgers, The State University; M.Phil. 1969, Ph.D. 1976, Yale University

Bart Francis Rice, *Assistant Professorial Lecturer in Mathematics*
B.A. 1965, Kent University; M.S. 1967, Ph.D. 1969, Louisiana State University; M.S. 1970, Johns Hopkins University

Charles Edward Rice, *Professor of Psychology; Assistant Dean of the Graduate School of Arts and Sciences*
B.S. 1954, Iowa State University of Science and Technology; Ph.D. 1959, Case Western Reserve University

Mary Rice, *Adjunct Associate Professor of Biological Sciences*
B.A. 1947, Drew University; M.A. 1949, Oberlin College; Ph.D. 1966, University of Washington

Gerald Murray Richman, *Assistant Professorial Lecturer in Forensic Sciences*
B.A. 1961, Western Maryland College; J.D. 1966, University of Maryland

Robert Isaac Richter, *Assistant Professorial Lecturer in Forensic Sciences*
B.A. 1967, University of Vermont; J.D. 1972, University of Chicago

Thomas Joseph Riegert, *Assistant Professorial Lecturer in Human Kinetics and Leisure Studies*
B.A. 1956, University of Cincinnati; M.A. 1977, American University

Anne Curtin Riley, *Adjunct Instructor in Accounting*
B.A. 1973, Nazareth College of Rochester; M.S. 1975, Syracuse University

William Lawrence Roach, Jr., *Adjunct Instructor in Health Care Administration*
B.S. 1970, Virginia Polytechnic Institute and State University; M.H.A. 1972, Medical College of Virginia of Virginia Commonwealth University

James Willis Robb, *Professor of Romance Languages*
B.A. 1939, Colgate University; M.A. 1950, Middlebury College; Ph.D. 1958, Catholic University of America

Philip Robbins, *Associate Professor of Journalism*
B.A. 1952, Washington and Lee University; M.S. 1955, Columbia University

Lilien Filipovitch Robinson, *Associate Professor of Art*
B.A. 1952, M.A. 1963, George Washington University; Ph.D. 1978, Johns Hopkins University

Thomas Robert Robinson, *Associate Professorial Lecturer in Economics*
B.A. 1965, M.Phil. 1976, Ph.D. 1974, George Washington University

Elie Rogers, *Associate Professorial Lecturer in Journalism*
B.A. 1958, University of Colorado

†Daniel David Roman, *Professor of Management Science*
B.S. in B.A. 1949, M.A. 1953, Ph.D. 1956, University of Southern California

Clyde Forrest Roper, *Adjunct Associate Professor of Biological Sciences*
B.S. 1958, Transylvania University; M.S. 1962, Ph.D. 1967, University of Miami

Colin Campbell Rorrie, Jr., *Associate Professorial Lecturer in Health Care Administration*
B.A. 1964, Beloit College, M.A. 1966, Ph.D. 1968, University of Iowa

Carolyn Rusch Rose, *Adjunct Assistant Professor of Art and Anthropology*
B.A. 1971, Sweet Briar College; M.A. 1976, George Washington University

Joseph Rosewater, *Adjunct Associate Professor of Biological Sciences*
B.S. 1950, M.S. 1956, University of New Hampshire; Ph.D. 1960, Harvard University

Edward Daniel Ross, Jr., *Assistant Professorial Lecturer in Forensic Sciences*
B.A. 1967, College of St. Thomas; J.D. 1970, Georgetown University

† On sabbatical leave fall semester 1979.
* On sabbatical leave spring semester 1980.

Patricia Ann Rossiter-Ravenscroft, *Clinical Instructor in Art Therapy*
B.A. 1972, Duke University; M.A. 1974, George Washington University

Lawrence Allen Rothblat, *Associate Professor of Psychology*
B.A. 1964, M.A. 1967, Ph.D. 1968, University of Connecticut

James Morton Rovelstad, *Professorial Lecturer in Human Kinetics and Human Studies*
B.S. M.S. 1953, University of Illinois; M.B.A. 1957, Ph.D. 1970, University of Michigan

Walter Frederick Rowe, *Assistant Professor of Forensic Sciences*
B.S. 1967, Emory University; M.A. 1968, Ph.D. 1975, Harvard University

William Woodin Rowe, *Associate Professor of Russian*
B.A. 1956, Harvard University; Ph.D. 1968, New York University

David Alton Rowley, *Associate Professor of Chemistry; Assistant Dean of the Graduate School of Arts and Sciences*
B.S. 1962, M.S. 1964, State University of New York at Albany; Ph.D. 1968, University of Illinois

Margaret Rozga, *Assistant Professorial Lecturer in English*
B.A. 1967, Alverno College; M.A. 1971, Ph.D. 1977, University of Wisconsin—Milwaukee

Vicki Margaret Gillis Russell, *Lecturer in English*
B.A. 1968, Tufts University; M.A. 1972, University of Georgia

William Rutiser, *Assistant Professorial Lecturer in Statistics*
B.S. 1967, George Washington University

Robert Clinton Rutledge, *Associate Professor of English; Assistant Dean of Columbian College of Arts and Sciences*
B.A. 1940, University of Virginia; M.A. 1957, Ph.D. 1966, George Washington University

Bradley William Sabelli, *Assistant Professor of Speech and Drama*
B.F.A. 1970, Florida Atlantic University; M.A. 1972, California State University, Hayward; M.F.A. 1974, George Washington University

Howard Morley Sachar, *Professor of History*
B.A. 1947, Swarthmore College; M.A. 1950, Ph.D. 1953, Harvard University

James Minor Sachlis, *Assistant Professor of Business Administration*
B.S. 1964, M.B.A. 1966, D.B.A. 1975, University of Maryland

Pilar G. Suelto de Saenz, *Associate Professor of Spanish*
Licenciada 1950, University of Madrid; M.A. 1957, Bryn Mawr College; Ph.D. 1966, University of Maryland

George Max Saiger, *Associate Professorial Lecturer in Forensic Sciences*
B.A. 1963, Harvard University; M.D. 1967, Albert Einstein College of Medicine

Stephen Walter Salant, *Associate Professorial Lecturer in Economics*
B.A. 1967, Columbia University; Ph.D. 1973, University of Pennsylvania

Steven Charles Salop, *Associate Professorial Lecturer in Economics*
B.A. 1966, University of Pennsylvania; M.Phil. 1971, Ph.D. 1972, Yale University

John F. Santino, *Assistant Professorial Lecturer in American Civilization and in Anthropology*
B.A. 1970, Boston College; M.A. 1973, University of Pennsylvania

Burton Malcolm Sapin, *Professor of International Affairs and Political Science; Dean of the School of Public and International Affairs*
B.A. 1943, M.A. 1947, Columbia University; Ph.D. 1953, Princeton University

Richard M. Scheffler, *Associate Professor of Economics*
B.S. 1965, University of Vermont and Hofstra University; M.A. 1967, City University of New York, Brooklyn College; Ph.D. 1971, New York University

Stefan Otto Schiff, *Professor of Zoology*
B.S. 1952, Roanoke College; Ph.D. 1964, University of Tennessee, Knoxville

Richard Harold Schlagel, *Professor of Philosophy*
B.S. 1949, Springfield College; M.A. 1952, Ph.D. 1955, Boston University

Jeffrey Schlom, *Adjunct Associate Professor of Genetics*
B.S. 1963, Ohio State University; M.S. 1966, Adelphi University; Ph.D. 1969, Rutgers—State University

Marilyn Strauss Schmal, *Clinical Instructor in Art Therapy*
B.A. 1969, M.A. 1974, George Washington University

Frank Schmidt, *Adjunct Associate Professor of Psychology*
B.A. 1966, Swarthmore College; M.S. 1968, Ph.D. 1970, Purdue University

William Edward Schmidt, *Professor of Chemistry*
B.S. 1943, M.S. 1950, George Washington University; M.A., Ph.D. 1953, Princeton University

Henry Frederick Schuelke III, *Assistant Professorial Lecturer in Forensic Sciences*
B.A. 1964, Saint Peter's College; J.D. 1967, Villanova University

Milton Allan Schwartz, *Associate Professorial Lecturer in Statistics*
B.S. 1938, City University of New York, City College

Robert Lee Schweitzer, *Associate Professorial Lecturer in Business Administration*
B.S. 1971, Towson State University; M.A. 1973, University of Delaware; Ph.D. 1975, Duke University

Lois Green Schwoerer, *Professor of History*
B.A. 1949, Smith College; M.A. 1952, Ph.D. 1956, Bryn Mawr College

Ormond Albert Seavey, *Assistant Professor of English*
B.A. 1966, Carleton College; M.A. 1968, Ph.D. 1976, Columbia University

Frank William Segel, *Associate Professorial Lecturer in Accounting*
B.S. 1959, Johns Hopkins University; M.B.A. 1964, M.Phil. 1971, Ph.D. 1972, George Washington University

Barbara Rae Seidman, *Studio Lecturer in Applied Music (Harp)*
Mus.B. 1969, Cleveland Institute of Music; Mus.M. 1970, Northwestern University

Richard Paul Seifert, *Assistant Professor of Biology*
B.A. 1968, Grinnell College; Ph.D. 1974, State University of New York at Stony Brook

Ruth O. Selig, *Lecturer in Anthropology*
B.A. 1964, Wellesley College; M.A.T. 1966, Harvard University; M.A. 1975, George Washington University

Anastasia Seremetis, *Assistant Professorial Lecturer in Art*
B.A. 1973, M.F.A. 1975, George Washington University

Elwood Lewis Shafer, Jr., *Professorial Lecturer in Human Kinetics and Leisure Studies*
B.S. 1956, M.F. 1957, Pennsylvania State University; Ph.D. 1966, State University of New York College of Environmental Science and Forestry

Stephen Shaffer, *Assistant Professor of Political Science*
B.A. 1968, University of Colorado; M.A. 1970, Ph.D. 1975, University of Michigan

Stanley Shaloff, *Professorial Lecturer in History*
B.A. 1960, City University of New York, City College; M.A. 1962, Ph.D. 1967, Northwestern University

Jenny Schulter Shapiro, *Lecturer in English*
B.A. 1966, George Washington University

Robert Poindexter Sharkey, *Professor of Economic History*
B.A. 1948, Princeton University; Ph.D. 1958, Johns Hopkins University

Thomas Elliott Shaughnessy, *Associate Professor of Management, George Washington University Program (Tidewater Area Center), Hampton, Va.*
B.S. 1953, Massachusetts Institute of Technology; M.A. in Ed. 1948, George Washington University; Ed.D. 1957, Johns Hopkins University

Zalman Arthur Shavell, *Professorial Lecturer in Management Science*
B.Aero.Eng. 1960, Rensselaer Polytechnic Institute; M.B.A., 1962, Ph.D. 1969, University of Maryland

Lawrence Shaw, *Research Professor of Statistics*
B.A. 1935, Ohio Wesleyan University; M.A. 1936, University of Pennsylvania

Debra R. Sheldon, *Adjunct Instructor in Accounting*
B.A. 1966, Northwestern University; M.B.A. 1974, Drexel University

Charles C. Shepherd, Jr., *Assistant Professorial Lecturer in Business Administration*
B.S. 1971, University of Texas; J.D. 1978, American University

Stanley Newton Sherman, *Associate Professor of Business Administration*
B.A. 1952, M.B.A. 1960, D.B.A. 1977, University of Maryland

*Chung-wen Shih, *Professor of Chinese*
B.A. 1945, St. John's University, China; M.A. 1949, Ph.D. 1955, Duke University

Jay Robert Shotel, *Associate Professor of Special Education*
B.A. 1967, Ed.M. 1970, Ed.D. 1972, Temple University

Robert George Shouldice, *Associate Professor of Health Care Administration*
B.A. 1966, Lycoming College; M.B.A. 1969, D.B.A. 1974, George Washington University

Walter Allen Shropshire, Jr., *Professorial Lecturer in Botany*
B.S. 1954, M.S. 1956, Ph.D. 1958, George Washington University

Eugene Joseph Shuchart, *Associate Professorial Lecturer in Accounting*
B.S. 1950, Villanova University; M.B.A. 1951, University of Pennsylvania; C.P.A. 1956, State of Virginia

†Robert Hermann Shumway, *Professor of Statistics*
B.A. 1956, Carleton College; M.S. 1960, Iowa State University of Science and Technology; **Ph.D. 1965, George Washington University**

Robin Christopher Sickles, *Assistant Professor of Economics*
B.S. 1972, Georgia Institute of Technology; Ph.D. 1976, University of North Carolina

Herschel Sidransky, *Professor of Pathology*
B.S. 1948, M.D. 1953, M.S. 1958, Tulane University

‡Frederic Richard Siegel, *Professor of Geochemistry*
B.A. 1954, Harvard University; M.S. 1958, Ph.D. 1961, University of Kansas

Robert Sumner Sigafoos, *Professorial Lecturer in Botany*
B.S. 1942, M.S. 1943, Ohio State University; M.A. 1949, Ph.D. 1951, Harvard University

Gaston Sigur, *Professor of International Affairs; Director, Institute for Sino-Soviet Studies*
Ph.D. 1957, University of Michigan

‡David Elliot Silber, *Professor of Psychology*
B.A. 1958, Wayne State University; M.A. 1960, Ohio University; Ph.D. 1965, University of Michigan

Peter Silberman, *Professorial Lecturer in Journalism*
B.A. 1952, City University of New York, Queens College; M.A. 1956, University of Missouri

Suzanne Lee Simons, *Associate Professor of Anthropology*
B.A. 1948, Ohio State University; M.A. 1964, Ph.D. 1969, University of New Mexico

Thomas D. Simpson, *Professorial Lecturer in Economics*
B.A. 1964, University of Minnesota; Ph.D. 1968, University of Chicago

Richard Sines, *Assistant Professor of Economics*
B.A. 1965, Miami University; M.S. 1969, M.A. 1972, Ph.D. 1975, Ohio State University

Nozer Darabsha Singpurwalla, *Professor of Operations Research and Research Professor of Statistics*
B.S. 1959, B.V. Bhoomraddi College of Engineering and Technology, India; M.S.(E.E.) 1962, **Rutgers—The State University; Ph.D. 1968, New York University**

Daniel Sinick, *Professor of Education*
B.A. 1936, City University of New York, City College; M.A. 1937, State University of New York at Albany; **Ph.D. 1955, New York University**

Myrna Carol Sislen, *Studio Lecturer in Applied Music (Guitar)*
B.A. 1970, American University

Michelle Lynn Slagle, *Visiting Instructor in Business Administration*
B.B.A. 1970, M.B.A. 1973, George Washington University

C.B. Smiley, Jr., *Adjunct Assistant Professor of Health Care Administration and Assistant Professorial Lecturer in Forensic Sciences*

---

* On sabbatical leave fall semester 1979.
† On sabbatical leave spring semester 1980.
‡ On sabbatical leave academic year 1979-80.

Arthur Hall Smith, *Assistant Professor of Painting*
B.F.A. 1961, Illinois Wesleyan University

Benjamin Williams Smith, *Professor of Biochemistry*
B.S. 1940, Virginia Polytechnic Institute and State University; M.S. 1947, Ph.D. 1951, George Washington University

George Wilson Smith, *Associate Professor of Education*
B.A. 1953, Central State College; Ed.M. 1965, Ed.D. 1971, University of Maryland

Jeffrey A. Smith, *Lecturer in English*
B.A. 1975, Georgetown University

Joseph Thurston Smith, *Associate Professorial Lecturer in Forensic Sciences*
M.D. 1952, University of Alberta

Linda T. Smith, *Assistant Professorial Lecturer in Art*
B.F.A. 1975, Florida International University

Paul Albert Smith, *Professorial Lecturer in International Affairs*
B.S.F.S. 1949, Georgetown University; M.P.A. 1957, Harvard University

Walton Edward Smith, *Associate Professor of Management Science*
B.S. 1960, M.S. 1962, University of Missouri; D.Sc. 1972, George Washington University

William Arthur Smith, *Associate Professor of Mathematics*
B.A. 1941, M.A. 1947, Syracuse University

Richard Saxon Snell, *Professor of Anatomy and of Orthopaedic Surgery*
M.B., B.S. 1949, Ph.D. 1955, M.D. 1961, University of London

Olav Christen Snellingen, *Professorial Lecturer in Economics*
LL.M. 1957, Oslo University, Norway

Jeanne Ellen Snodgrass, *Professor of Human Kinetics and Leisure Studies*
B.A. 1952, Ohio Wesleyan University; M.S. in P.E. 1954, Smith College; Ed.D. 1975, University of North Carolina at Greensboro

Nancy Joan Shore Sobel, *Assistant Professor of Special Education*
B.S. 1956, University of Michigan; M.A. in Ed. 1959, George Washington University; Ed.D. 1978, American University

Michael Joseph Sodaro, *Visiting Assistant Professor of International Affairs and Political Science*
B.A. 1967, Fordham University; M.A. 1970, Johns Hopkins University; Ph.D. 1978, Columbia University

Israel Gregory Sohn, *Adjunct Professor of Geology*
B.S. 1935, City University of New York, City College; M.A. 1938, Columbia University; Ph.D. 1965, Hebrew University, Israel

George Solomon, *Assistant Professorial Lecturer in Business Administration and in Management Science*
B.S.B.A. 1971, Central Connecticut State College; M.B.A. 1972, Suffolk University

Henry Solomon, *Professor of Economics; Dean of the Graduate School of Arts and Sciences*
B.A. 1949, City University of New York, Brooklyn College; M.A. 1950, Ph.D. 1959, New York University

Thomas Songster, *Associate Professorial Lecturer in Human Kinetics and Leisure Studies*
B.A. 1962, Doane College; M.A. 1963, Northeast Missouri State University; Ph.D. 1967, University of Utah

Jayne Baker Spain, *Distinguished Visiting Professor of Government and Business Administration*
B.S. 1947, University of California, Berkeley; LL.D. 1969, Edgecliff College; Dr.Pub.Serv. 1970, George Washington University; LL.D. 1970, University of Cincinnati; LL.D. 1972, Dunbarton College of the Holy Cross; D.H.L. 1972, Bryant College of Business Administration; LL.D. 1973, Springfield College; LL.D. 1973, Gallaudet College; D.H.L. 1973, Russell Sage College; D.H.L. 1976, Loyola College; D.H.L. 1978, Westminster College (Pennsylvania)

Don Allen Sparks, *Associate Professorial Lecturer in Journalism*
B.A. 1976, San Jose State University

Paul Eppley Spiegler, *Associate Professorial Lecturer in Biological Science*
B.S. 1958, University of Maryland; M.A. 1960, George Washington University

Marina Stajic, *Assistant Professorial Lecturer in Forensic Sciences*
B.S. 1972, University of New Sad, Yugoslavia; Ph.D. 1977, University of Maryland

Loretta May Stallings, *Professor of Human Kinetics and Leisure Studies*
B.A. 1961, Stanford University; M.A. 1963, University of the Pacific; Ed.D. 1967, University of Texas at Austin

George Stambuk, *Professor of International Affairs*
Abs.Jur. 1943, University of Zagreb, Yugoslavia; M.A. 1956, Ph.D. 1961, Indiana University

Carol Buchalter Stapp, *Research Instructor in Education*
B.A. 1967, Tulane University; M.A. 1969, University of Pennsylvania

James Edward Starrs, *Professor of Law*
B.A. 1956, LL.B. 1960, St. John's University, New York; LL.M. 1964, New York University

Donald Eugene Starsinic, *Assistant Professorial Lecturer in Geography and Regional Science*
B.A. 1952, University of Pittsburgh; M.A. 1957, University of Chicago

Clarence Sternberg, *Assistant Professorial Lecturer in English*
B.A. 1962, City University of New York, City College; M.A. 1967, University of Connecticut; Ph.D. 1969, University of Pennsylvania

*Carl Steiner, *Professor of German*
B.A. 1956, M.A. 1962, Ph.D. 1966, George Washington University

George Steiner, *Professor of Music; Director of Orchestra*
B.S. 1938, Mus.B. 1938, Mus.M. 1940, Johns Hopkins University

Chirstopher Willie Sten, *Associate Professor of English*
B.A. 1966, Carleton College; M.A. 1968, Ph.D. 1971, Indiana University

George Christopher Stephens, *Adjunct Assistant Professor of Geology*
B.S. 1967, M.S. 1969, George Washington University; Ph.D. 1972, Lehigh University

*Richard Walton Stephens, *Professor of Sociology*
B.A. 1951, Franklin and Marshall College; M.A. 1953, Ph.D. 1956, University of North Carolina

Charles Todd Stewart, Jr., *Professor of Economics*
B.A. 1946, M.A. 1948, Ph.D. 1954, George Washington University

Edward C. Stewart, *Associate Professorial Lecturer in Psychology*
B.A. 1950, University of Maryland; Ph.D. 1957, University of Texas

Phyllis Langton Stewart, *Associate Professor of Sociology*
B.A. 1961, M.A. 1962, California State University, Los Angeles; Ph.D. 1968, University of California, Los Angeles

Eugene Almon Stone, *Associate Professor of Mathematics*
B.A. 1960, Vanderbilt University; Ph.D. 1966, University of Virginia

James Ashley Straw, *Professor of Pharmacology*
B.S. 1958, Ph.D. 1963, University of Florida

Allyn Douglas Strickland, *Assistant Professor of Economics*
B.A. 1962, Cornell University; M.A. 1975, Ph.D. 1976, University of Wisconsin

Nancy Striffler, *Associate Professorial Lecturer in Speech*
B.A. 1963, Temple University; M.S. 1964, University of Michigan

Margaret Ann Strom, *Adjunct Instructor in English*
B.A. 1967, American University; M.A. 1970, University of Maryland

George Stuart, *Associate Professorial Lecturer in Anthropology*
B.S. 1956, University of South Carolina; M.A. 1970, George Washington University; Ph.D. 1975, University of North Carolina

Theodore Suranyi-Unger, Jr., *Research Professor of Economics*
B.A. 1950, Syracuse University; Dr. rer. pol. 1957, University of Vienna

Amin Mohammed Suria, *Assistant Professor of Pharmacology*
B.S. 1963, M.S. 1964, University of Karachi, Pakistan; Ph.D. 1971, Vanderbilt University

Sterling Scott Sutton, *Associate Professorial Lecturer in Economics*
B.A. 1952, M.A. 1956, University of Florida; M.A. 1964, Ph.D. 1968, George Washington University

* On sabbatical leave spring semester 1980.

Paravastu Swamy, *Adjunct Professor of Economics*
M.A. 1957, M.S. 1958, Andhra University, India; Ph.D. 1968, University of Wisconsin

*Choy-Tak Taam, *Professor of Mathematics*
B.S. 1942, University of Illinois; M.A. 1943, Ph.D. 1945, Harvard University

Roland Henry Tanck, *Associate Research Professor of Psychology*
B.A. 1939, University of Wisconsin; M.A. 1948, Ph.D. 1950, George Washington University

†Morton Frank Taragin, *Associate Professor of Physics*
B.S. in Engr. 1945, M.Phil. 1947, Ph.D. 1950, George Washington University

Thomas Clinton Teeples, *Assistant Professorial Lecturer in Statistics*
B.S. 1966, George Washington University

Albert Harris Teich, *Associate Professor of Public Affairs*
B.S. 1964, Ph.D. 1969, Massachusetts Institute of Technology

Geza Teleki, Jr., *Associate Professorial Lecturer in Anthropology*
B.A. 1967, George Washington University; M.A. 1970, Ph.D. 1977, Pennsylvania State University

Douglas Harold Teller, *Professor of Design and Graphics*
B.A. 1956, Western Michigan University; M.F.A. 1962, George Washington University

Charles J. Testa, *Associate Professor of Management Science*
B.S. 1961, Lafayette College; M.S. 1965, Ph.D. 1969, University of California, Los Angeles

Alvin Thaler, *Professorial Lecturer in Mathematics*
B.A. 1959, Columbia University; Ph.D. 1966, Johns Hopkins University

*Jean-François Marie Thibault, *Assistant Professor of French*
Baccalauréat 1967, Licence ès Lettres 1971, Diplôme d'Études 1968, Académie de Paris; Ph.D. 1976, University of Maryland

Joan Elizabeth Thiel, *Assistant Professor of Speech*
B.A. 1965, Marygrove College; M.F.A. 1971, Catholic University of America; Ph.D. 1975, University of Michigan

Klaus Thoenelt, *Professor of German*
Staatsexamen 1956, Ph.D. 1961, University of Freiburg

Elizabeth Marshall Thomas, *Lecturer in English*
B.A. 1954, Radcliffe College

Raymond Edward Thomas, *Associate Professor of Statistics*
B.A. 1957, M.A. 1967, M.P.A. 1972, George Washington University

Irene Thompson, *Associate Professor of Russian*
B.S. 1955, M.S. 1960, Georgetown University

Ronald Bettes Thompson, *Professor of European History*
B.A. 1949, Yale University; Ph.D. 1954, University of Chicago

Shirley E. Thompson, *Adjunct Instructor in English*
B.A. 1973, Kalamazoo College; M.A. 1977, University of Michigan

Richard Thornton, *Professor of History and International Affairs*
B.A. 1961 Colgate University; Ph.D. 1966, University of Washington

Samuel Thurm, *Professorial Lecturer in Business Administration*
B.A. 1939 Dartmouth College; M.B.A. 1941, Columbia University

Max David Ticktin, *Special Lecturer in Hebrew*
B.A. 1945, University of Pennsylvania; Rabbi 1951, D.D. 1977, Jewish Theological Seminary of America

Charles Stanley Tidball, *Henry D. Fry Professor of Physiology and Research Professor of Medicine*
B.A. 1950, Wesleyan University; M.S. 1952, University of Rochester; Ph.D. 1955, University of Wisconsin; M.D. 1958, University of Chicago

Mary Elizabeth Tidball, *Professor of Physiology*
B.A. 1951, LL.D. 1978, Mount Holyoke College; M.S. 1953, Ph.D. 1955, University of Wisconsin; Sc.D. 1959, Wilson College; D.Sc. 1968, Trinity College (Connecticut); D.Hum. 1971, St. Mary's College (Indiana); D.Sc. 1977, Centre College of Kentucky; D.Sc. 1978, The University of the South

†On sabbatical leave spring semester 1980
*On sabbatical leave academic year 1979-80.

Neil Avrill Tilkens, *Associate Professor of Music*
Mus.B. 1950, Columbia Union College; Mus.M. 1952, Philadelphia Conservatory of Music

Rodney Tillman, *Professor of Education*
B.A. 1943, Henderson State College; M.A. 1949, Ed.D. 1955, Columbia University

Barbara Mills Timberlake, *Associate Professorial Lecturer in Biological Sciences*
B.S. 1952, George Washington University; M.A. 1955, Amherst College

*Edwin Timbers, *Professor of Government and Business Relations*
B.A. 1944, West Virginia University; M.A. 1951, Ph.D. 1954, University of Michigan

Nicholas Diggs Tiscione, *Assistant Professor of Special Education*
B.A. 1968, M.A. 1972, Ph.D. 1974, Hofstra University

George Todaro, *Adjunct Professor of Genetics*
B.A. 1958, Swarthmore College; M.D. 1963, New York University

Susan J. Tolchin, *Associate Professor of Public Administration*
B.A. 1961, Bryn Mawr College; M.A. 1962, University of Chicago; Ph.D. 1968, New York University

Margaret Cooper Tolson, *Adjunct Assistant Professor of Music*
Mus.B. 1931, Mus.M. 1936, University of Rochester

Carl Augustus Troester, Jr., *Professorial Lecturer in Human Kinetics and Leisure Studies*
B.S. 1967, Southeast Missouri State University; M.A. 1968, University of Missouri; Ed.D. 1942, Columbia University

Joseph Louis Tropea, *Associate Professor of Sociology*
B.A. 1962, Wayne State University; M.A. 1965, Michigan State University; Ph.D. 1973, George Washington University

Philip True, *Associate Professorial Lecturer in Geography*
B.A. 1948, Western Michigan University; M.S. 1950, University of Chicago

Linda Albertson Tsantis, *Assistant Professor of Special Education*
B.A. 1965, M.A. 1970, Old Dominion University; Ed.D. 1974, George Washington University

David George Tuerck, *Associate Professorial Lecturer in Economics*
B.A. 1962, M.A. 1964, George Washington University; Ph.D. 1966, University of Virginia

Colin M. Turnbull, *Visiting Professor of Anthropology*
B.A. 1947, M.A. 1949, B.Litt. 1957, D.Phil. 1964, Oxford University

Mortimer Darling Turner, *Associate Professorial Lecturer in Geology*
B.S. 1943, M.S. 1954, University of California, Berkeley; Ph.D. 1972, University of Kansas

Curtis Edward Tuthill, *Associate Professor of Psychology*
B.A. 1935, Macalester College; M.A. 1936, Ph.D. 1939, University of Iowa

Alan D. Ullberg, *Associate Professorial Lecturer in Art*
B.A. 1954, Reed College; LL.B. 1960, Harvard University

Elinor Ulman, *Adjunct Associate Professor of Art Therapy*
B.A. 1930, Wellesley College; B.S. 1943, Iowa State University of Science and Technology

Stuart Umpleby, *Associate Professor of Management Science*
B.S., B.A. 1967, M.A. 1969, Ph.D. 1975, University of Illinois

George Vartkes Vahouny, *Professor of Biochemistry*
B.S. 1953, M.S. 1955, Ph.D. 1958, George Washington University

Peter B. Vaill, *Professor of Human Systems*
B.A. 1955, University of Minnesota; M.B.A. 1960, D.B.A. 1964, Harvard University

Barbara Ann Von Barghahn, *Assistant Professor of Art*
B.A. 1970, University of Iowa; M.A. 1972, Ph.D. 1979, New York University

Clemmont Eyvind Ventress, *Professor of Education*
B.A. 1952, Kentucky State College; M.S. 1956, Ph.D. 1963, Indiana University

Alan G. Wade, *Assistant Professor of Speech*
B.A. 1966, Northwestern University; M.A. 1972, Catholic University of America

Catherine Allen Wagner, *Adjunct Assistant Professor of Anthropology*
B.A. 1960, St. John's College (Maryland); M.A. 1972, Ph.D. 1978, University of [illegible]

* On leave of absence academic year 1979-80.

Richard David Walk, *Professor of Psychology*
B.A. 1942, Princeton University; M.A. 1947, University of Iowa; M.A. 1949, Ph.D. 1951, Harvard University

Glenn Anthony Walker, *Associate Professor of Biochemistry*
B.A. 1953, Bellarmine College; Ph.D. 1968, Michigan State University

*Robert Harris Walker, Jr., *Professor of American Civilization*
B.S. 1945, Northwestern University; M.A. 1950, Columbia University; Ph.D. 1955, University of Pennsylvania

Dewey Wallace, Jr., *Professor of Religion*
B.A. 1957, Whitworth College; B.D. 1960, Princeton Theological Seminary; M.A. 1962, Ph.D. 1965, Princeton University

Perry Eugene Wallace, Jr., *Adjunct Instructor in Law*
B.E. 1970, Vanderbilt University; J.D. 1975, Columbia University

Ruth Ann Wallace, *Professor of Sociology*
B.A. 1961, Immaculate Heart College; M.A. 1963, University of Notre Dame; Ph.D. 1968, University of California, Berkeley

Regis Hills Walther, *Professorial Lecturer in Management Science*
B.A. 1941, University of California, Los Angeles; M.A. 1960, Ph.D. 1963, George Washington University

George Ching Yuan Wang, *Assistant Professor of Chinese*
B.A. 1951, Taiwan Normal University; M.S. 1955, Tokyo University of Education

Ming Wang, *Lecturer in Chinese*

William Arthur Ward, *Professorial Lecturer in Management Science*
B.A. 1961, M.A. 1968, Ph.D. 1970, University of Colorado

Thomas Howard Wardlow, *Studio Lecturer in Applied Music (Percussion Instruments)*
B.S. 1962, M.S. 1964, University of Illinois

James Hutchinson Ware, *Associate Professorial Lecturer in Statistics*
B.A. 1963, Yale University; Ph.D. 1969, Stanford University

Charles Woodrow Washington, *Associate Professor of Public Administration*
B.A. 1968, M.P.A. 1971, Florida Atlantic University; Ph.D. 1978, Syracuse University

Wallace Knapp Waterfall, *Associate Professorial Lecturer in Journalism*
B.A. 1950, Wabash College

Don Wayne Watkins, *Associate Professor of Physiology*
B.Ch.E. 1961, University of Louisville; Ph.D. 1968, University of Wisconsin

Stephen Jay Wayne, *Associate Professor of Political Science and Public Affairs*
B.A. 1961, University of Rochester; M.A. 1963, Ph.D. 1968, Columbia University

Lawrence Howard Wechsler, *Assistant Professorial Lecturer in Forensic Sciences*
B.S. 1967, Pennsylvania State University; J.D. 1970, George Washington University

Leo Augustus Weigant, *Assistant Professorial Lecturer in English*
B.A. 1962, M.A. 1963, University of Michigan; Ph.D. 1969, Duke University

Edward Ronald Weismiller, *Professor of English*
B.A. 1938, Litt.D. 1959, Cornell College; M.A. 1942, Harvard University; D.Phil. 1950, Oxford University

Priscilla Welling, *Assistant Professor of Accounting*
B.A. 1955, City University of New York, Queens College; M.S. 1970, Rensselaer Polytechnic Institute; Ph.D. 1974, New York University

Peter Werres, *Assistant Professorial Lecturer in German*
M.Phil. 1972, Ph.D. 1977, George Washington University

Harvey Robert Wertlieb, *Associate Professorial Lecturer in Health Care Administration*
B.A. 1961, M.B.A. 1964, George Washington University

*On sabbatical leave academic year 1979-80.

John Lee Westrate, *Professorial Lecturer in Public Administration*
B.A. 1944, Illinois College; M.A. 1949, Ph.D. 1963, University of Chicago

Briggs J. White, *Professorial Lecturer in Forensic Sciences*
B.A. 1932, D.C.L. 1965, Sterling College; M.A. 1936, Ph.D. 1940, University of Colorado

*David Gover White, *Professor of Chemistry*
B.Ch.E. 1950, Cornell University; Ph.D. 1954, Harvard University

Jane Elizabeth White, *Studio Lecturer in Applied Music (Voice)*
Mus.B. 1950, University of Rochester; M.A. 1963, American University

Richard Otis White, *Studio Lecturer in Applied Music (Oboe)*
Mus.B. 1950, University of Rochester

Sarah Elizabeth White, *Lecturer in Human Kinetics and Leisure Studies*

John Theodore Wieseman, *Associate Professorial Lecturer in Forensic Sciences*
B.A. 1958, Wesleyan University; LL.B. 1963, Columbia University

Garland Dean Wiggs, *Associate Professor of Education*
B.B.A. 1956, University of Cincinnati; M.A. 1960, University of Northern Colorado, Ed.D. **1971, George Washington University**

Gail Roggin Wilensky, *Associate Professorial Lecturer in Economics*
B.A. 1964, M.A. 1965, Ph.D. 1968, University of Michigan

Ellen Reeder Williams, *Adjunct Assistant Professor of Art*
B.A. 1969, Wellesley College; M.A. 1972, Ph.D. 1974, Princeton University

Katherine Johnston Williams, *Lecturer in Art Therapy*
B.A. 1962, University of Wisconsin; M.A. 1977, George Washington University

Noriko Kurosawa Williams, *Lecturer in Japanese*
B.A. 1970, Keio Gijuku University, Japan

Sharon Willig, *Associate Professorial Lecturer in Speech*
B.S. in Ed. 1963, University of Georgia; M.A. 1971, University of Maryland

Robert Crumpton Willson, *Associate Professor of Journalism*
B.A. 1951, George Washington University

Lawrence Winkler, *Professor of Education*
B.S. 1952, M.A. 1954, Washington University; Ed.D. 1965, George Washington University

Erik Kenelm Winslow, *Associate Professor of Behavioral Sciences*
B.S. 1961, Pennsylvania State University; M.S. 1965, Ph.D. 1967, Case Western Reserve University

Gail Wisan, *Adjunct Associate Professor of Sociology*
B.A. 1966, City University of New York, Hunter College; M.A. 1969, Ph.D. 1972, University of Illinois

Maida Rust Withers, *Associate Professor of Human Kinetics and Leisure Studies*
B.A. 1958, Brigham Young University; M.S. 1960, University of Utah

Sharon Lee Wolchik, *Visiting Assistant Professor of International Affairs and Political Science*
B.A. 1970, Syracuse University; M.A. 1972, Indiana University, Ph.D. 1978, University of **Michigan**

Thomas William Wolfe, *Professorial Lecturer in International Affairs*
B.A. 1935, Hiram College; M.A. 1950, Columbia University; Ph.D. 1955, Georgetown University

Roger Alan Wolff, *Clinical Instructor in Art Therapy*
B.A. 1956, University of Maryland; M.Phil. 1973, George Washington University

Kirk Marcus Wolter, *Associate Professorial Lecturer in Statistics*
B.A. 1970, St. Olaf College; M.S. 1972, Ph.D. 1974, Iowa State University

Reuben Esselstyn Wood, *Professor of Chemistry*
B.S. 1936, Ph.D. 1939, California Institute of Technology; M.S. 1937, University of Chicago

William Thomas Woodward, *Assistant Professor of Painting*
B.A. 1957, M.A. 1961, American University

* On sabbatical leave fall semester 1979.

John Franklin Wright, Jr., *Associate Professor of Drawing and Graphics*
B.A. 1954, American University; M.A. 1960, University of Illinois

William Ralph Wright, *Studio Lecturer in Applied Music (Clarinet and Saxophone)*
Diploma 1951, Curtis Institute of Music; Mus.M. 1971, Catholic University of America

Helen Bates Yakobson, *Professor of Russian*
B.S. 1935, Harbin Law School, Manchuria

Diane Marcia Yeager, *Assistant Professorial Lecturer in Religion*
B.A. 1968, Ohio University; M.A. 1975, Duke University

Harry Elwood Yeide, Jr., *Professor of Religion*
B.A. 1950, Williams College; B.D. 1957, Union Theological Seminary; Ph.D. 1965, Harvard University

*Anthony Marvin Yezer, *Associate Professor of Economics*
B.S. 1966, Dartmouth College; M.S. 1967, London School of Economics and Political Science; Ph.D. 1974, Massachusetts Institute of Technology

Richard Yi-chang Yin, *Associate Professor of Economics*
LL.B. 1940, Fu Jen University, China; M.A. 1950, University of Denver; Ph.D. 1966, Columbia University

Meira Ellen Ziedek, *Associate Clinical Professor of Psychology*
B.A. 1951, Hunter College; [illegible] M.A. 1961, Ph.D. 1964, Johns Hopkins University

Betty Zeiger, *Clinical Instructor in Art Therapy*
B.A. 1962, M.A. 1964, American University

Steven J. Zeitlin, *Assistant Professorial Lecturer in American Civilization and Anthropology*
B.S. 1966, University of Pennsylvania; M.A. 1972, Bucknell University

Isidore Zietz, *Professorial Lecturer in Geology*
B.S. 1939, M.S. 1940, City University of New York, City College

Isaiah Morris Zimmerman, *Associate Clinical Professor of Psychology*
B.A. 1952, M.S.W. 1956, University of California, Berkeley; Ph.D. 1967, Catholic University of America

John Edmund Zvalkovsky, *Associate Professor of Classics*
B.A. 1956, Duke University; Ph.D. 1963, University of North Carolina

Thomas William Zito, Jr., *Assistant Professorial Lecturer in Journalism*
B.S. 1970, Georgetown University

Bernard Charles Zook, *Associate Professor of Pathology (Comparative)*
B.S. 1956, D.V.M. 1963, Colorado State University

Artley Joseph Zuchelli, *Professor of Physics*
B.A. 1955, Ph.D. 1962, University of Virginia

Jack Zwick, *Professor of Business Administration*
B.S. 1959, D.B.A. 1961, [illegible] M.B.A. 1961, George Washington University

CONSULTANTS IN RESEARCH—GRADUATE SCHOOL OF ARTS AND SCIENCES

Robert S. Adelstein, *Head, Section on Molecular Cardiology, Cardiology Branch, National Heart, Lung, and Blood Institute* [Biochemistry, Structure and Function of Contractile Proteins]
B.A. 1955, Princeton University; M.D. 1959, Harvard University

James Adkins, *Chief, Nutritional Sciences Branch, Division of Nutrition, U.S. Food and Drug Administration* [Biological Sciences (Nutrient Bioavailability)]
B.S. 1955, Western State College; M.S. 1958, Ph.D. 1961, University of Wisconsin

*On sabbatical leave spring semester 1980

Elizabeth Potts Anderson, *Research Biochemist, Laboratory of Biochemistry, National Cancer Institute*; Metabolism of Purines and Pyrimidines
B.A. [illegible], Lawrence College; M.S. [illegible], University of Wisconsin; Ph.D. 1961, Stanford University

W. French Anderson, *Head, Section on Molecular Hematology, National Heart and Lung Institute*; Genetics
B.A. 1958, M.D. 1963, Harvard University; M.A. 1960, Cambridge University

Attab Ahmed Ansari, *Head, Cellular Immunology Division, Naval Medical Research Institute, National Naval Medical Center*; Microbiology (Immunology)
B.S. 1961, D.J. Government Science College, Pakistan; M.S. 1963, University of Karachi; M.S. 1967, University of California, Los Angeles; Ph.D. 1970, University of Arizona

Richard Asofsky, *Head, Experimental Pathology Section, National Institute of Arthritis, Metabolism, and Digestive Diseases*; Immunology
M.D. 1958, State University of New York

Jerry Laurens Barnard, *Curator, Division of Crustacea, U.S. National Museum of Natural History, Smithsonian Institution*; Crustacean Biology
B.A. 1949, M.S. 1950, Ph.D. 1959, University of Southern California

Joseph Bellanti, *Professor of Pediatrics and of Microbiology, Georgetown University School of Medicine*; Microbiology (Immunology)
B.S. 1954, M.D. 1958, State University of New York at Buffalo

Larry Bilker, *Chief Psychologist, Bradley Day Hospital, Rhode Island*; Psychology (Family and Child Diagnosis and Therapy)
B.A. 1960, City University of New York, Brooklyn College; M.A. 1966, Ph.D. 1970, University of Florida

Ethel Joan Blanchette-Mackie, *Director, Electron Microscopy Laboratory, Section for Nutrition and Endocrinology, National Institute of Arthritis, Metabolism and Digestive Diseases*; Biology of Lipids
B.S. 1956, City University of New York, Queens College; M.S. 1959, New York University; Ph.D. 1963, Columbia University

Larry Bockstahler, *Chief, Pathologic Studies Section, Division of Biological Effects, Bureau of Radiological Health, Food and Drug Administration, U.S. Department of Health, Education and Welfare Public Health Service*; Genetics (Radiation Bio-effects)
B.S. 1956, Michigan State University; M.S. 1961, Ph.D. 1964, University of Wisconsin

Charles Boone, *Head, Cell Biology Section, Viral Biology Branch, National Cancer Institute*; Microbiology (Virology)
M.D. 1952, University of California, San Francisco; Ph.D. 1960, University of California, Los Angeles

Wallace Bowman, *Chief, Environment and Natural Resources Policy Division and Senior Specialist in Environmental Policy, Congressional Research Service, Library of Congress*; American Civilization (Man, Nature and Environment)
B.A. 1949, M.S. 1953, Washington University; M.A. 1956, Yale University

Murray Frederick Brennan, *Senior Investigator, Surgery Branch, National Cancer Institute; Biochemistry* (Surgical Science)
B.S. 1961, University of New Zealand; M.B.Ch.B. 1964, University of Otago, New Zealand

Milton Brightman, *Head, Section on Neurocytology, Laboratory of Neuropathology and Neuroanatomical Sciences, National Institute of Neurological Diseases*; Anatomy (Neuroanatomy)
B.S. 1945, M.A. 1948, University of Toronto, Canada; Ph.D. 1954, Yale University

Stephen Wheeler Burks, *Director of Solid Waste Project, National League of Cities*; State and Local Politics
B.A. 1962, Stanford University; M.A. 1969, Ph.D. 1972, Michigan State University

Charles Philip Butcher, *Professor of English and Dean of the Graduate School, Morgan State College*; American Civilization (Afro American Literature and History)
B.A. 1942, M.A. 1947, Howard University; Ph.D. 1956, Columbia University

Keven John Catt, *Chief, Reproduction Branch, National Institute of Child Health and Human Development*; Endocrine Pharmacology
B.S. 1959, M.D. 1963, University of Melbourne, Australia; Ph.D. 1967, Monash University, Australia

Kenneth Shueh-Shen Chang, *Head, Viral Oncogenesis Section, Laboratory of Cell Biology, National Cancer Institute*; Microbiology (Virology)
M.D. 1951, National Taiwan University; Doctor of Medical Science 1958, Tokyo University

John Young Cole, Jr., *Chairman, The Librarian's Task Force on Goals, Organization and Planning, Library of Congress*; American Civilization
B.A. 1964, M.L.S. 1963, University of [illegible]; M.A. 1966, [illegible]; Ph.D. 1971, George Washington University

Bruce Collette, *Assistant Director, Bureau of Commercial Fisheries, Systematics Laboratory, Smithsonian Institution*; Biology of Fishes
B.S. 1956, Ph.D. 1961, Cornell University

Robert Emmett Darcy, *Political Science Department, Oklahoma State University*; Political Science (Politics and Social Change)
B.A. 1956, University of Wisconsin; M.A. 1958, Ph.D. 1961, University of Kentucky

Clyde Dawe, *Head, Comparative Oncology Section, Laboratory of Pathology, National Cancer Institute*; Biological Sciences (Oncology)
B.A. 1942, Lafayette College; M.D. 1945, Johns Hopkins University; Ph.D. 1955, University of Minnesota

John Farrar, *Senior Staff Fellow, National Institute of Dental Research*; Microbiology (Immunology)
B.A. 1960, M.S. 1965, Miami University; Ph.D. 1972, University of Notre Dame

Mattie Rae Spivey Fox, *Chief, Minerals Section, Nutritional Sciences Branch, Division of Nutrition, U.S. Food and Drug Administration*; Biochemistry (Mineral Nutrition)
B.S. 1942, Texas Women's University; M.S. 1945, Iowa State University; Ph.D. 1953, George Washington University

John Eric Fredland, *Professor of Economics, U.S. Naval Academy*; Public Finance
B.A. 1963, Harvard University; M.A. 1966, Ph.D. 1970, University of Michigan

Ernst Freese, *Chief, Molecular Biology Laboratory, National Institute of Neurological Disorders, Communicable Diseases, and Stroke*; Biochemistry (Mutagens, Control Mechanisms, and Properties of Membranes)
Vordiplom 1950, University of Heidelberg; Diplom 1951, Ph.D. 1953, University of Gottingen

Robert M. Friedman, *Chief, Laboratory of Experimental Pathology, National Institute of Arthritis, Metabolism, and Digestive Diseases*; Experimental Pathology
B.A. 1954, Cornell University; M.D. 1958, New York University

Jerry David Gardner, *Chief, Section of Gastroenterology, Digestive Diseases Branch, National Institute of Arthritis, Metabolic and Digestive Diseases*; Physiology (Digestive Diseases)
B.A. 1962, University of Kansas; M.D. 1966, University of Pennsylvania

Robert Gibbs, Jr., *Chairman, Department of Vertebrate Zoology National Museum of Natural History, Smithsonian Institution*; Vertebrate Zoology
B.A. 1951, Ph.D. 1955 Cornell University

Frederick Richmond Goff, formerly *Chief, Rare Book Division, Reference Department, Library of Congress*; American Civilization (History of Printing and the Book)
B.A. 1937, M.A. 1939, Litt.D. 1965, Brown University

Joseph Goldstein, *Assistant Professor of Metallurgy, Department of Metallurgy and Material Science, Lehigh University*; Meteorite Study
B.S. 1960, M.S. 1962, D.Sc. 1964, Massachusetts Institute of Technology

Robert Goldstein, *Chief, Pulmonary Immunology Research Laboratory, Veterans Administration Hospital*; Microbiology (Immunology)
B.A. 1962, Brandeis University, M.D. 1966, Jefferson Medical College; Ph.D. 1976, Washington University

James Granger, *Chief of Child Guidance Service and Director of Training, Walter Reed General Hospital*; Art Therapy
B.A. 1955, University of California, Berkeley; M.D. 1961, University of Rochester

Gordon Guroff, *Head, Section on Intermediary Metabolism, Laboratory of Biomedical Sciences, National Institute of Child Health and Human Development*; Amino Acid Metabolism
B.S. 1954, University of Illinois; M.S. 1956, Auburn University; Ph.D. 1959, University of Wisconsin

John Hardt, *Senior Specialist in Soviet Economics, Congressional Research Service, Economic Division, Library of Congress*; Soviet Economics (Comparative Economic Systems)
B.A. 1949, M.A. 1951, University of Washington; M.A. 1955, Ph.D. 1955, Columbia University

Joseph Ernest Hazel, *Research Geologist, Paleontology and Stratigraphy Branch, U.S. Geological Survey*; Paleontology
B.A. 1952, M.A. 1956, University of Missouri; Ph.D. 1963, Louisiana State University Agricultural and Mechanical College

Ronald Herberman, *Head, Cellular and Tumor Immunology Section, Laboratory of Cell Biology, National Cancer Institute*; Tumor Immunology
B.A. 1960, M.D. 1964, New York University

Peter N. Herbert, *Director, Division of Clinical and Experimental Atherosclerosis, The Mount Hospital*; Biochemistry (Lipoproteins)
B.S. 1963, Rensellaer Polytechnic Institute; M.D. 1967, Yale University

Gary Hodgen, *Chief, Section on Endocrinology, Reproduction Research Branch, National Institute of Child Health and Human Development*; Physiology (Reproductive Endocrinology)
B.Sc. 1965, M.Sc. 1966, Purdue University; Ph.D. 1969, Ohio State University

Jane M. Holmes, *Staff Neuropsychologist, Department of Psychiatry, Grace's Hospital Medical Center*; Psychology (Learning Disabilities)
B.A. 1956, University of Vermont; Ph.D. 1974, University of

Loren Horton, *State Historical Society of Iowa*; American Civilization (History of Iowa)
B.A. 1955, M.A. 1960, University of Northern Iowa

Richard Houbrick, *Supervisory Marine Biologist, Smithsonian Oceanographic Sorting Center, Smithsonian Institution*; Biological Sciences (Malacology)
B.A. 1956, Harvard College; M.S. 1967, University of Miami; Ph.D. 1971, University of South Florida

Thelma Hunt, *Professor Emeritus of Psychology*; Abnormal Psychology
B.A. 1924, M.A. 1925, Ph.D. 1927, M.D. 1935, George Washington University

David Jacobowitz, *Chief, Section on Histochemistry, Laboratory of Clinical Science, National Institute of Mental Health*; Pharmacology (Neuropharmacology)
B.S. 1956, City College of New York, City University; M.S. 1958, Ph.D. 1962, Ohio State University

Meredith Leam Jones, *Curator, Division of Worms, Smithsonian Institution*; Invertebrate Zoology
B.A. 1948, M.A. 1952, Ph.D. 1956, University of California, Berkeley

Shung-chang Jong, *Head, Mycology Department, American Type Culture Collection*: Microbiology
B.S. 1960, National Taiwan University; M.S. 1966, Western Illinois University; Ph.D. 1969, Washington State University

Robert Konrad Kahn, *Psychotherapist (Private Practice)*: Psychotherapy
B.A. 1946, University of Pennsylvania; M.A. 1953, George Washington University; Ph.D. 1957, Pennsylvania State University

Marvin W. Kranz, *Specialist in American History, Library of Congress*; American Civilization (American History)
B.A. 1951, Ph.D. 1961, Syracuse University

Floyd M. Kregenow, *Senior Member, Laboratory of Kidney and Electrolyte Metabolism, National Heart, Lung, and Blood Institute*: Membrane Transport Processes
B.S. 1957, Rutgers—The State University; M.D. 1962, Yale University

Laurence Pereira Leite, *Professor Emeritus of Art*; Art History
M.A. 1956, Ph.D. 1966, Johns Hopkins University
M.D. 1962, University of Chicago

Robert Levy, *Director, Division of Heart and Vascular Diseases, National Heart and Lung Institute*: Biochemistry (Lipoproteins)
B.A. 1957, Cornell University; M.D. 1961, Yale University

Darrell Liu, *Acting Section Chief, Biochemistry of Microbial Structure, National Institute of Child Health and Human Development*, Peptides and Protein Structure
B.S. 1956, National Taiwan University; Ph.D. 1961, University of Pittsburgh

David R. Livengood, *Research Physiologist, Department of Neurobiology, Armed Forces Radiation Biology Research Institute*: Physiology of Synapse, Membrane Biophysics, and Sodium Transport Mechanisms
B.A. 1960, Butler University; Ph.D. 1965, Indiana University

Walter McKay Lovenberg, *Section Chief, Biochemical Pharmacology, Experimental Therapeutics Branch, National Heart, Lung, and Blood Institute*; Structure and Function of Proteins
B.S. 1956, M.S. 1958, Rutgers—The State University; Ph.D. 1962, George Washington University

Philip Lundeberg, *Curator, Division of Naval History, Smithsonian Institution*; American Civilization (Military and Naval History)
B.A. 1947, M.A. 1951, Duke University; Ph.D. 1955, Harvard University

William Madow, Statistics (Sample Survey Design)
B.A. 1932, M.A. 1933, Ph.D. 1938, Columbia University

Rose Mage, *Career Investigator, Laboratory of Immunology, National Institute of Allergy and Infectious Diseases*, Immunogenetics
B.S. 1956, Cornell University; Ph.D. 1963, Columbia University

Ronald W. Manderscheid, *Senior Research Sociologist, National Institute of Mental Health*: Sociology (Socialization and Stratification)
B.A. 1965, Loras College; M.A. 1967, Marquette University; Ph.D. 1971, University of Maryland

Scott R. Mazzur, *Senior Research Scientist, Blood Research Laboratory, The American National Red Cross*: Microbiology (Immunology)
B.A. 1957, Rutgers—The State University (Douglass College); Ph.D. 1966, University of Pennsylvania

Barbara F. Meeker, *Associate Professor of Sociology, University of Maryland*: Sociology (Mathematical Sociology)
B.A. 1961, University of Kansas; M.A. 1964, Ph.D. 1969, Stanford University

Mortimer Mishkin, *Research Psychologist, Section on Neuropsychology, National Institute of Mental Health*; Experimental Psychology
B.A. 1946, Dartmouth College; M.A. 1949, Ph.D. 1951, McGill University

Jerry Mitchell, *Chief, Section on Clinical Pharmacology and Metab... Office of the Director of Intramural Research, National Heart, L... and Blood Institute;* **Pharmacology**
B.A. 1963, University of Kentucky; M.D. 1968, Ph.D. 1969, Vanderbilt University

Brian R. Murphy, *Staff Associate, Laboratory of Infectious Diseases, N... tional Institute of Allergy and Infectious Diseases;* Virology
B.A. 1964, Wesleyan University; M.D. 1969, University of Rochester

William Guy Nash, Biological Sciences (Genetics)
B.S. 1963, M.A. 1965, University of Michigan

James Clark Osborne, Jr., *Staff Fellow, National Heart, Lung, and Bloo... Institute (Molecular Branch):* Genetics (Physical Chemistry of M... molecules)
B.A. 1970, M.S. 1972, Ph.D. 1974, University of Maryland

Diane Brickley Parsons, *Assistant Research Professor of Orthop... Surgery, George Washington University School of Medicine and He... Sciences;* **Biochemistry (Collagen)**
B.A. 1966, Newton College, Ph.D. 1973, Boston University

Andrew Peacock, *Supervisory Research Chemist, National Cancer Ins... tute;* **Biological Sciences (Cell Biology)**
B.S. 1943, M.S. 1947, Ph.D. 1949, Massachusetts Institute of Technology

John Pisano, *Head, Section of Physiological Chemistry, Experimen... Therapeutics Branch, National Heart, Lung, and Blood Institu...* Physiological Chemistry
B.S. 1951, Pennsylvania State University; M.S. 1953, Ph.D. 1955, Rutgers—The State Univers...

John W. Porter, *Chief, Lipid Metabolism Laboratory, and Professor, De... partment of Physiological Chemistry, University of Wisconsin,* **Bi... chemistry (Lipid Metabolism)**
B.S. 1938, Ph.D. 1942, University of Wisconsin

Robert Miles Pratt, Jr., *Research Chemist, Craniofacial Anomalies Section, Laboratory of Developmental Biology and Anomalies, National Institute of Dental Research:* Pharmacology (Biochemical Teratogenesis)
B.A. 1965, M.A. 1966, University of Colorado; Ph.D. 1970, Boston University

Allen Raskin, *Research Psychologist, Psychopharmacology Resear... Branch, National Institute of Mental Health:* Psychopharmacology
B.A. 1949, Syracuse University; M.S., Ph.D. 1954, University of Illinois

Wayne D. Rasmussen, *Leader, Agricultural Historical Program, Econo... Research Service, U.S. Department of Agriculture:* History (Agricultu... History)
B.A. 1937, University of Montana, M.A. 1939, Ph.D. 1950, George Washington University

Alvin Richman, *Public Opinion Analyst, Bureau of Public Affairs, Dep... ment of State;* **International Affairs**
B.S. 1957, Massachusetts Institute of Technology; M.I.A. 1959, Columbia University; Ph... 1968, University of Pennsylvania

George S. Roth, *Research Biochemist, Gerontology Research Center, N... tional Institute on Aging;* **Gerontology Research**
B.S. 1968, Villanova University; Ph.D. 1971, Temple University

Alan N. Schechter, *Chief, Section on Macromolecular Biology, Laboratory of Chemical Biology, National Institute of Arthritis, Metabolic and Di... gestive Diseases;* **Biochemistry (Proteins)**
B.A. 1959, Cornell University; M.D. 1963, Columbia University

Frank L. Schmidt, *Personnel Research Psychologist, Research Se... Personnel Research and Development, U.S. Civil Service Commis...* **Psychology (Personnel Psychology)**
B.A. 1966, Bellarmine College; M.S. 1968, Ph.D. 1970, Purdue University

Leonard Peter Schultz, *Curator of Fishes, Smithsonian Institution*; Vertebrate Zoology (Ichthyology)
B.A. 1924, Albion College; M.S. 1926, University of Michigan; Ph.D. 1932, University of Washington

David Segal, *Research Chemist, National Cancer Institute, National Institutes of Health*; Biochemistry (Immunoglobulins)
B.A. 1961, Oberlin College; Ph.D. 1966, Johns Hopkins University

Robert Sumner Sigafoos, *Botanist, U.S. Geological Survey*; Plant Ecology
B.S. 1942, M.S. 1947, Ohio State University; M.A. 1949, Ph.D. 1951, Harvard University

Lyman Bradford Smith, *Senior Botanist, Department of Botany, Smithsonian Institution*; Plant Taxonomy
B.A. 1925, M.A. 1928, Ph.D. 1930, Harvard University

Louis Sokoloff, *Chief, Laboratory of Cerebral Metabolism, National Institute of Mental Health*; Biochemistry (Brain Biochemistry)
B.A. 1943, M.D. 1946, University of Pennsylvania

John R. Stephenson, *Head, Viral Genetics Section, National Cancer Institute*; Virology
B.S. 1965, University of British Columbia; M.S. 1966, University of Guelph, Canada; Ph.D. 1970, University of Toronto

Sarah Stewart, *Medical Director, Human Virus Leukemia Section, National Cancer Institute*; Viral Leukemia
B.S. 1927, New Mexico State University; M.S. 1930, University of Massachusetts; Ph.D. 1939, University of Chicago; M.D. 1949, Georgetown University

Keith Larry Storrs, Political Science (Latin American Government and Politics)
B.A. 1962, Brigham Young University; Ph.D. 1972, Cornell University

Celia White Tabor, *Staff Member, Laboratory of Biochemical Pharmacology, National Institute of Arthritis, Metabolism, and Digestive Diseases*; Biochemistry (Intermediary Metabolism)
B.A. 1940, Radcliffe College; M.D. 1945, Columbia University

Herbert Tabor, *Chief, Laboratory of Biochemical Pharmacology, National Institute of Arthritis, Metabolism, and Digestive Diseases*; Biochemistry (Intermediary Metabolism)
B.A. 1937, M.D. 1941, Harvard University

John F. Tallman, *Head, Section on Biochemistry and Pharmacology, National Institute of Mental Health*; Biochemistry (Complex Lipids)
B.S. 1968, Ph.D. 1972, Georgetown University

Robert Ting, *Scientific Director, Biotech Research Laboratories*; Virology
B.A. 1954, M.A. 1956, Amherst College; Ph.D. 1960, University of Illinois

Robert W. Wannemacher, Jr., *Senior Biochemist, Biochemistry and Nutrition, U.S. AMRIID, Fort Detrick*; Biochemistry (Biochemistry and Nutrition)
B.S. 1950, Wagner College; M.S. 1951, Ph.D. 1960, Rutgers—The State University

Wilcomb Edward Washburn, *Director, Office of American Studies, Smithsonian Institution*; American Civilization
B.A. 1948, Dartmouth College; Ph.D. 1955, Harvard University

Stanley Howard Weitzman, *Curator of Fishes, Smithsonian Institution*; Biological Sciences (Ichthyology)
B.A. 1951, M.A. 1953, University of California, Berkeley; Ph.D. 1960, Stanford University

FIELD OF STUDIES CONSULTANTS— GRADUATE SCHOOL OF ARTS AND SCIENCES

Donna Ari, *Curator of Education, Corcoran Gallery of Art*: Muse... Training
B.A. 1961, University of Connecticut

William Back, *Research Hydrologist, U.S. Geological Survey*; Geolog... (Hydrogeology)
B.S. 1948, University of Illinois; M.S. 1955, University of California, Berkeley; M.P.A. 19... Harvard University; Ph.D. 1960, University of Nevada

Thomas Bower, *Assistant Registrar for the Permanent Collection, Nation... Collection of Fine Arts, Smithsonian Institution*; Museum Training
B.A. 1970, University of Notre Dame

Joseph Carr, *Administrator, Carlyle House Historic Park*; Museum Train... ing
B.A. 1972, Centre College of Kentucky

Cary Carson, *Coordinator of Research and Architectural Historian, St. Mary's City Commission (Maryland)*; American Civilization (Vernac... Architecture)
B.A. 1963, Carleton College; M.A. 1965, University of Delaware; Ph.D. 1975, Harvard U... versity

Crose Evans, *Curator, Loans and Exhibitions, National Gallery of Art*; American Civilization (English Art History)
B.F.A. 1941, M.A. 1942, Ohio State University; Ph.D. 1953, Johns Hopkins University

Jean Federico, *Curator, DAR Museum*; Museum Training
B.A. 1951, N... University; M.A. ... University of M...

Alan Fern, *Chief, Prints and Photographs Division, Library of Congr...*; American Civilization (American and European Cinema)
B.A. 1950, M.A. 1954, Ph.D. 1960, University of Chicago

Janet Flint, *Curator, Department of Prints and Drawings, National Gal... tion of Fine Arts, Smithsonian Institution*; Museum Training
B.S. 1951, ... University; M.A. 1960, University of Mi...

Joseph Fulton, *Specialist in Labor Economics and Relations, Congress... Research Service, Library of Congress*; American Civilization (La... History)
B.A. 1946, M.A. 1948, New York University

Susan Hobbs, *Joint Curator, National Collection of Fine Arts and Freer G... lery, Smithsonian Institution*; Museum Training
B.A. 1966, Scripps College; Ph.D. 1974, Cornell University

Alan Jabbour, *Director, Folk Arts Division, National Endowment for t... Arts*; American Civilization (Folk Music)
B.A. 1960, University of Miami; M.A. 1966, Ph.D. 1968, Duke University

John Bennett Kuiper, *Head, Motion Picture Section, Division, Prints ... Photographs, Library of Congress*; American Civilization (Mass Media— Movies and Television)
B.A. 1950, University of Kentucky; M.A. 1957, Ph.D. 1960, University of Iowa

Alison MacTavish, *Curator of the Octagon House*; Museum Train... B.A. 1966, Boston University; M.A. 1969, State University of New York College ...

Vernon McKay, *Professor of African Studies, School for Advanced ... national Studies, Johns Hopkins University*; African History
B.A. 1931, Baker University; M.A. 1934, Syracuse University; Ph.D. 1939, Cornell Uni...

Ellen Myette, *Assistant Curator, Renwick Gallery, National Collec... Fine Arts, Smithsonian Institution*; Museum Training
B.A. 1968, The Western College

James Newcomb Norris IV, *Associate Curator, Algae, Department of Botany, National Museum of Natural History, Smithsonian Institution;* Biology (Marine Botany)
B.A. 1966, M.A. 1971, San Francisco State College; Ph.D. 1975, University of California, Santa Barbara

Harry Z. Rand, *Associate Curator, Twentieth Century Department, National Collection of Fine Arts, Smithsonian Institution;* Museum Training
B.F.A. 1969, City University of New York, City College; M.A. 1971, Ph.D. 1974, Harvard University

Samuel I. Shibko, *Chief, Natural and Environmental Toxicants Branch, Division of Toxicology, Bureau of Foods, Food and Drug Administration;* Biochemistry (Food Toxicology)
B.Sc. 1954, University of Birmingham, England; Ph.D. 1958, University of London

Julian Wood Witherell, *Head, African Section, Library of Congress, American Civilization* (African History)
B.A. 1956, Bowdoin College; M.A. 1958, Ph.D. 1964, University of Wisconsin

INDEX

Abbreviations, key to, 194-95
Academic work load:
  Columbian College, 68
  Division of University Students, 181
  Graduate School of Arts and Sciences, 95, 97
  School of Education and Human Development, 104-5
  School of Government and Business Administration, 137-38, 146-47
  School of Public and International Affairs, 164
Academic status of the University, 12-13
Accounting, 195
  B.B.A. requirements, 137-38
  M.Acct., 144-48, 195
  M.B.A. field, 148-49, 195
  D.B.A. requirements, 158-59
  Practice internship, 141-42
Accreditation, 12-13
Achievement tests, *See* Examinations
Activities, student, 60-61
Administration, officers of, 16-18
Administration, health care, M.A. in H.C.A., 156-57
Administration of science and technology, M.B.A., 149-50
Admission, 20-27
  See also college or school concerned
Advanced placement tests, *See* Examinations
Advanced standing, 22-23
  See also college or school concerned
Algebra, graduate courses, 375
Alumni association, 55
Alumni career services, 57-58
American art, M.A. concentration, 218
American civilization (American Studies Program), 199
American literature, 293, 300
American College Testing Program, *See* Examinations
American religious history, Ph.D. field, 434
American Studies Program, 199
Anatomy, 206
Analysis and applied mathematics, graduate courses, 375
Anthropology, 208
Apartments, 60
Applied mathematics, 370-71, 375
Applied music, 383-84, 386
Applied statistics, degree programs, 477-78
Art, 216
  As a teaching field, 115
Art therapy, graduate study, 230
Assistantships, 36
Astronomy, 398
Athletics, 62
  See also Human Kinetics and Leisure Studies
Auditing, 31, 47
Awards, 36-38, 39-43
Balance sheet, 48
Biochemistry, 232
Biological sciences, 234
  As a teaching field, 115
Board of Trustees, 14
Botany, 234-35, 240
Business administration, 243
  B.B.A. requirements, 137-39
  M.B.A. requirements, 148-49
  D.B.A. requirements, 158-59
Business, economics, and public [illegible]
  M.B.A., 150
Calendar, 5
Career services, student and alumni, [illegible]
Cartographic science, B.S. in, [illegible]
Center for academic and administrative computing, 54-55
Center for Social Policy Studies, 190
Ceramics, M.F.A. field, 219
Certification for teachers, 130
Changes in program of studies, 47
Chemistry, 253
  Graduate placement examination, [illegible]
  As a teaching field, 115
Chinese language and literature, B.A. program, 77, 168, 263
Classical archeology and anthropology, B.A. program, 209, 217
Classical archeology and classics, [illegible] program, 218, 259
Classical archeology, classics, and history, M.A. field, 218, 259, 334
Classical art and archeology, M.A. [illegible] tration, 218
Classical humanities, B.A. program, [illegible]
Classics, 259
College Entrance Examination Board [illegible] and College-Level Examination [illegible] gram, *See* Examinations
Colleges, schools, and divisions of the University, 10-12
Columbian College of Arts and Sciences, 63-85
Commencement, *see* Graduation
Committees:
  Of the University, 18, 61
  See also college or school [illegible]
Communications, teaching field, 114
Composition, Mus.M. field, 384
Computer science:
  B.A., B.S. requirements in [illegible] statistics, 477
  See also M.A., M.S. in applied [illegible]

Computer science (Cont.)
matics, 370; management science courses, 362; M.B.A., information systems technology, 151
See also School of Engineering and Applied Science *Bulletin*
Conduct, regulations concerning, 46
Conducting, Mus.M. field, 384
Consortium of Universities, 28, 52-53
Consultants:
Field of studies, 87, 540
In research, 87, 533
Contemporary art, M.A. concentration, 218
Continuing education for women, 55
Continuing student, 27
Continuous enrollment, 48
Cooperative programs, 99-100
Correspondence courses, 70, 139, 167
Council of Arts and Sciences, 65-66
Counseling Center, 56-57
Course numbers, explanation of, 193-94
Courses of instruction, 193
Course offerings, time of, 195
Credit, 47
Balance sheet, 48
By examination 22, 75, 139-40
Earned through USAFI, 23
Explanation of amount of, 195
For professional courses granted by Columbian College, 74
For service school courses, 23
From other institutions, 22 *see also* college or school concerned
Post-admission transfer, 47-48
Repeating courses for, *see* college or school concerned
Transfer of, within the University, 47; *see also* college or school concerned
Credit/no credit option, *see* college or school concerned
Criminal justice, graduate study, 305
Dance, B.S. in H.K.L.S., 116-17
Dean of Students, office of, 56
Dean's Councils, *see* college or school concerned
Dean's honor list, *see* college or school concerned
Declaration of major, Columbian College, 72
Deferred payment plans, 31-32
Degree programs, 10-12
Departmental honors, 50
Departmental majors, 84
Design, M.F.A. field, 219
Disabilities, services for students with, 57
Dishonesty, regulations concerning, 46
Dismissal of students, 46, 51, 52
Dissertation requirements, 49, 50, 98-99, 125, 159
Distinction, degrees earned with, 50
Division of Experimental Programs, 184
Division of University Students, 179-183
Doctor of Medicine, combined degree programs, 82, 93-94
Dormitories, 58-59
Dramatic art, degree programs, 466
Dropping courses, 46; *see also* college or school concerned
Early admission plan, 21
Early childhood education, 113-14
Earth science teaching fields, 114, 115
East Asia, M.A. field, 174-75
East Asian languages and literatures, 263
East Asian Studies, B.A. program, 77-78, 168
Economics, 266
Economics group option, B.A. field in public affairs, 169-70
Economics option, B.B.A., 143
Education, Department of, 275
Education and Human Development, School of, 101-31
Degree requirements:
B.A. in Ed., 109
B.S. in H.K.L.S., 109
Ed.D., 127
Ed.S., 126
M.A. in Ed., 120
M.A.T., 119
Education policy, graduate study, 292
Educational Leadership, Institute for, 188
Educational Opportunity Program, 57
Educational Resources Information Center (ERIC), 190-91
Elementary education program, 113-14
Emeriti faculty, 491
Employed students' academic work load, see Academic work load
Employment, student, 38, 57
Engineering, *see* School of Engineering and Applied Science *Bulletin*
English, 293
American literature, 293, 300
English literature, 293, 297
Composition, 295
Correct use of, 69, 135, 166
For international students (English as a foreign language), 55-56, 295
Placement examination, 23, 73, 295
Requirement, 72
Special honors, 294
As a teaching field, 115
Test of, as a foreign language, 28
Entrance requirements, *see* college, school, or division concerned
Environmental studies, 302
Equal opportunity, university policy on, 13
Examinations:
American College Testing Program, 67, 136
College Entrance Examination Board:
Achievement Tests, 23-24, 67, 105, 136, 181
Advanced Placement Tests, 22, 75

Examinations (Cont.)
College-Level Examination Program, 22, 75, 139, 167
Scholastic Aptitude Tests, 67, 107, 136, 161
Columbian College special departmental, 75
Comprehensive, for Ed.D., 12[illegible]
Comprehensive, for Ed.S., 12[illegible]
Defense of dissertation, 98, 129
English as a foreign language, 26, 89
Foreign language, for graduate study, 95-98, 173
General, for Ph.D. candidates, 98
Graduate management admission test, 145-46, 158
Graduate placement in chemistry, 255
Graduate Record Examination, 88, 145-46, 158, 171; *see also* department concerned
Major, in Columbian College, 83
Master's comprehensive, 96, 125-26, 147, 173
Miller Analogies Test, 126, 145, 419
National Teacher, 111
Placement, 73-76
Qualifying, for D.B.A. and D.P.A. candidates, 158
Tool requirement:
For doctoral study, 97-98
For master's candidacy, 95-96, 173
Waiver, 76
Exceptional children, education of teachers of, 129
Experimental Humanities, 304
Columbian College regulation, 75
Service-learning courses, 448
Experimental Programs, Division of, 184-85
Faculty and staff of instruction, 491
Fees, 28-30
Food service, 59-60
Residence halls, 59
Fellowships, 36, 99, 134
Field-of-study majors, 83-84
Field of studies consultants, 540
Finance and investments, M.B.A., 150
Finance option, B.B.A., 143
Financial aid, 33-39
Educational opportunity program, 57
For international students, 38-39
For graduate students, 35, 38, 99, 134
For undergraduate students, 33-35
Law enforcement education program, 39
Loans, 31, 38
Prepaid and deferred payment plans, 31-32
Student employment, 38
Financial encumbrance, for nonpayment of fees, 31
Financial regulations, 28-32
Fine arts, 217-19, 224-30
Folger Institute for Renaissance and 18th-Century Studies, 100, 300, 345, 442
Food service, 59-60
Foreign language requirement, *See* [illegible] or school concerned
Forensic sciences, 305
French, 439
As a teaching field, 115
Galleries and museums, cooperative [illegible] grams, 99-100
General management systems and org[illegible] zational cybernetics, M.B.A., 151
General Studies, Associate in [illegible] Bachelor's degrees in, 66-67
General science, teaching field, 115
Genetics, 310
Geochemistry, degree programs, 254, [illegible]
Geodesy, B.S. in, 66
Geography and regional science, 313
As a teaching field, 115
Specialization, M.A. in Ed., 313
Geology, 317
As teaching fields in earth science, [illegible] 115
Germanic languages and literatures, [illegible]
As a teaching field, 115
Government and Business Administrat[illegible]
School of, 131-61
Degrees offered:
B.B.A., 135-44
D.B.A., D.P.A., 158-59
Grad. Cert. in H.C.A., 158
M.Acct., 144-48, 195
M.A. in H.C.A., 144-48, 156-57
M.B.A., 144-53
M.P.A., 144-48, 153-55
M. of Urb. and Reg. Plan., 144-48, [illegible]
Special programs, 160-61
Government intern scholarship p[illegible] [illegible]
Grades, 44-45; *see also* college or [illegible] concerned
Graduate Record Examination, *see* Ex[illegible] nations
Graduate School of Arts and Scienc[illegible] [illegible]-101
Degrees offered, 92-93
Off-campus degree programs, 101
Graduation: 29, 49, 91; *see* Calendar [illegible] dates
Grants, 35
Graphics, M.F.A. field, 219
Greek, 260
Handicapped students, *see* Disab[illegible] services for students with, 57
Health and accident insurance, 58
Health Care Administration, 327
B.S. in H.C.A., 327
Continuing education program, 160
International Institute, 160
M.A. in H.C.A. requirements, 145, [illegible]
Post-Master's Graduate Certificat[illegible]
Health service, student, 58
Hebrew, 260

History, 333
Of art, 217
Of religions—Hinduism, M.A., field in, 434
As a teaching field, 115-16
Waiver examinations for first-group courses, 76, 333
Home study courses, 70, 139, 167
Honorary trustees, 15
Honors program, secondary school, 183
Honors, special, 50; see also department or school concerned
Hospital administration, M.A. in H.C.A., 357
Housing, 60
Human kinetics and leisure studies, 346
Bachelor's degree requirements, 112-13, 116-17
Human systems, M.B.A., 150
Humanities, experimental, 304
Inactive status, 48, 71
Incomplete/authorized withdrawal, 45
Incomplete, removal of, see college or school concerned
Information processing option, B.B.A., 143
Information systems technology, M.B.A., 151
Institute for Education Leadership, 188
Institute for Management Science and Engineering, 191
Institute for Sino-Soviet Studies, 178-79, 355
Insurance, health and accident, 58
Interdisciplinary programs, Columbian College, 85
International affairs:
B.A. program, 77-78, 169
M.A. program, 175-76
See School of Public and, 161-70
International business:
B.B.A. option, 143-44
M.B.A. field, 151
International House, 57
International Institute for Health Care Administration, 160
International relations, doctoral study in, 356
International students admission, 25-26
Financial aid, 38-39
Internships, 36-37; see also school or department concerned
Italian, 443
Placement examination, 439
Japanese, 266
Journalism, 357
Labor studies, 360
Latin, 360
Latin American studies, 176
Law enforcement education program, 39
Leave of absence, 48, 91
Lectures, 13-14, 51
Library of Congress, cooperative program, 100, 201, 204
Life science teaching field, 114
Loans, 38
Logic, graduate courses in mathematics, 377
Management science, 362
Management Science and Engineering, Institute for, 191
Marketing: B.B.A., 144; M.B.A., 152
Master's comprehensive examinations, see Examinations
Mathematics, 369
Placement examination, 74
As a teaching field, 116
Mathematical statistics, degree programs, 377-78
Medical services, 58
Medical technology, B.S. program, see School of Medicine and Health Sciences *Bulletin*
Medicine and Health Sciences, School of, 82, 93-94; *see also* School of Medicine and Health Sciences *Bulletin*
Microbiology, 378
Middle school education program, 114
Mid-East Regional Resource Center, 191
Mid-semester warning, 70
Museum education, M.A.T. program, 119
Museum studies, graduate program, 381
Museum training, M.A. concentration, 218
Music, 383
As a teaching field, 116
Mycology, M.S. program, 389
National Health Policy Forum, 188
National Law Center, 160, 177-78; *see also* National Law Center *Bulletin*
National Teacher Examinations, 111
Natural Resources Policy Center, 191-92
New courses in general and interdisciplinary studies, 85
Ninety-hour program, bachelor's degree: Columbian College, 81
School of Public and International Affairs, 167
Nondegree status, 25, 179-83
Oceanography, B.S. in, 66
Off-campus degree programs, 12; *see also* college or school concerned, and the College of General Studies *Bulletin*
Officers of administration, 16
Organizations, student, 61
Painting, M.F.A. field, 219
Paris, sophomore year in, 70-71
Pathology, 389
Personnel management: B.B.A., 144; M.B.A., 152
Pharmacology, 391
Philosophy, 384
Philosophy and social policy, 394
Photography, M.F.A. field, 219
Physical education, see Human kinetics and leisure studies
Physical science, see Chemistry

Physics, 397
As a teaching field, 116
Physiology, 403
Policy studies and special projects, 186
Policy studies in science and technology, 186
Polish, 450
Political science, 406
Politics group option, B.A. field in public affairs, 169-70
Portuguese, 443
Post-admission transfer credit, 47-48
Postdoctoral study, 30
Premedical curriculum, 76-77
Prepaid and deferred payment plans, 31-32
Prizes, 39-43
Probation, *see* college, school, or division concerned
Procurement and contracting, M.B.A., 152
Professional courses, regulation concerning, Columbian College, 74
Programs, right to make changes in, 51
Property responsibility, 52
Proseminars, Columbian College, 83
Psychology, 418
Public administration, 427
Doctoral study, 158-59
Master's degrees, 145, 153-55
Public affairs:
B.A. requirements, 78, 169-70
M.A. requirements, 176-77
Public and International Affairs, School of, 161-79
B.A. programs, 164-70
M.A. programs, 170-77
Special programs, 177-79
Purchasing managers, certification of, 160
Quality-point index, 45
Quantitative analysis for decision-making, M.B.A., 152-53
Radio-television, B.A. program, 467
Reading Center, 53-54
Readmission, 25, 27
Refunds, 32
Registration, 27-28
Regulations, 44-52; *see also* Financial Regulations, and college, school or division concerned
Release of student information, University policy on, 51-52
Religion, 432
Religion and medical care, M.A. field, 433
Religions, history of—Hinduism, M.A. field, 434
Religious education, M.A. field, 433
Religious life, 61
Renaissance and baroque art, M.A. concentration, 216
Research, Sponsored, 190-92
Residence halls, 58-59
Residence requirements, 49; *see also* college or school concerned
Romance languages and literatures, 438
ROTC, 54
Rules of the University, right to change
Russia, graduate study and research, *see* Institute for Sino-Soviet Studies
Russian, 449
As a teaching field, 116
Russian and East European studies, M.A. program, 177
Sanskrit, 326
Scandinavian, 326
Scholarship requirements, 44-46; *see* college, school, or division concerned
Scholarships:
For international students, 38-39
Graduate, 37
Undergraduate, 33-35
Scholastic Aptitude Tests, *see* Examinations
Science and technology, policy studies, 186
Science, technology and public policy, M.A. program, 177
Sculpture, M.F.A. field, 219
Secondary education programs, 115-16
Secondary school honors program, 183
Semester hours of credit, 195
Senate, Faculty, 19
Serbo-Croatian, 451
Service-learning program, 184, 448
Columbian College regulation, 75
Service school courses, credit for, 23
Sino-Soviet studies, 178-79, 355
Slavic languages and literatures, 449
Smithsonian Institution, cooperative program, 99-100, 201, 204
Social Policy Studies, Center for, 190
Social science teaching field, 116
Social Research Group, 192
Sociology, 454
Sophomore year in Paris, 70-71
Soviet Union, graduate study and research, *see* Institute for Sino-Soviet Studies
Spanish, 438-39, 444-47
As a teaching field, 116
Spanish-American literature, degree programs, 438-39
Special Education, 461
B.A. in Ed., 113-14
Mid-East Regional Resource Center,
Special honors, 50; *see also* departments concerned
Special studies, master's degree programs, 88, 101, 394, 489
Speech and drama, 466
As a teaching field, 116
Speech and Hearing Clinic, 53
Speech communication, B.A. program,
Speech pathology and audiology, programs, 467
Sponsored research, 190-92
Statistics, 477

Student activities, 56
Student and Alumni Career Services, 57-58
Student employment, 36, 57-58
Student health service, 58
Student life, 56-62
Student government, 61
Student organizations, 61
Study abroad, 70-71, 166
Summer sessions, 185-86
Suspension, see college school, or division concerned
Teachers, certification for, 130
Tests, see Examinations
Thesis requirements, 49-50; see also school concerned
Tool requirements, see Examinations
Topology, graduate mathematics courses, 378
Traineeships, 36-37
Transcripts of record, 48
Transfer students, admission, 21
Transfer within the University, 47, 182
Trustees, Board of, 14-15
Tuition, 28-29
  Advanced deposit, 21-22
  Projected increases, 30-31
Tutorial study, 81
University Students, Division of, 179-83
Urban affairs, B.A. field, 78-79, 170
Urban and regional planning, 495
  M. of Urb. and Reg. Plan. requirements, 145, 156
Veterans benefits, 54
Vocational counseling, 56-57
Waiver examinations, see Examinations
Withdrawal, 32, 46; see also college, school, or division concerned
Women's studies, 488
Zoology, 234-35, 241

ANNUAL ISSUES OF UNIVERSITY BULLETINS

Requests for the following publications must include your zip code and should be addressed to the office indicated, George Washington University, Washington, D.C. 20052.

College of General Studies, Dean of the College
National Law Center, Admissions Office, National Law Center
School of Engineering and Applied Science, Dean of the School
Undergraduate and Graduate Programs (Arts and Sciences, Education and Human Development, Government and Business Administration, Public and International Affairs), Admissions Office
School of Medicine and Health Sciences, Admissions Office, School of Medicine and Health Sciences
Schedule of Classes: Fall (Preregistration Edition, Revised Edition) and Spring Semesters, Registrar
Schedule of Classes, Summer Sessions, Dean of the Summer Sessions

COLLEGES AND SCHOOLS—DEGREE PROGRAMS

Columbian College of Arts and Sciences: Associate in Arts (A.A.), Associate in Arts in General Studies (A.A. in Gen.Std.), Associate in Science in Cartographic Science (A.S. in Cart.Sc.), Associate in Science in Geodesy (A.S. in Geod.), Bachelor of Arts (B.A.), Bachelor of General Studies (B.Gen.Std.), Bachelor of Science (B.S.), Bachelor of Science in Cartographic Science (B.S. in Cart.Sc.), Bachelor of Science in Geodesy (B.S. in Geod.), and Bachelor of Science in Oceanography (B.S. in Ocea.)

Graduate School of Arts and Sciences: Master of Arts (M.A.), Master of Arts in Special Studies (M.A. in Sp.Std.), Master of Fine Arts (M.F.A.), Master of Forensic Sciences (M.F.S.), Master of Music (Mus.M.), Master of Science (M.S.), Master of Science for Teachers (M.S. for Teachers), Master of Science in Forensic Science (M.S.F.S.), Master of Science in Special Studies (M.S. in Sp.Std.), and Doctor of Philosophy (Ph.D.)

School of Medicine and Health Sciences: Associate in Science (A.S.), Bachelor of Science (B.S.), Bachelor of Science in Health Science (B.S. in H.Sc.), and **Doctor of Medicine (M.D.)**

National Law Center. Juris Doctor (J.D.), Master of Laws (LL.M.), Master of Comparative Law (M.Comp.L.), Master of Comparative Law (Am. Practice) (M.Comp.L. [Am.Prac.]), and Doctor of Juridical Science (S.J.D.)

School of Engineering and Applied Science: Bachelor of Science (Civil Engineering) B.S.[C.E.]), Bachelor of Science (Electrical Engineering) (B.S. [E.E.]), Bachelor of Science (Mechanical Engineering) (B.S. [M.E.]), Master of Engineering Administration (M.E.A.), Master of Science (M.S.), Engineer (Engr.), Applied Scientist (App.Sc.), and Doctor of Science (D.Sc.)

School of Education and Human Development: Bachelor of Arts in Education (B.A. in Ed.), Bachelor of Science in Human Kinetics and Leisure Studies (B.S. in H.K.L.S.), Master of Arts in Education (M.A. in Ed.), Master of Arts in Teaching (M.A.T.), Education Specialist (Ed.S.), and **Doctor of Education (Ed.D.)**

School of Government and Business Administration: Bachelor of Business Administration (B.B.A.), Bachelor of Science in Administration (B.S. in Adm.), Bachelor of Science in Health Care Administration (B.S. in H.C.A.), Master of Accounting (M.Acct.), Master of Arts in Health Care Administration (M.A. in H.C.A.), Master of Business Administration (M.B.A.), Master of Public Administration (M.P.A.), Master of Science in Administration (M.S. in Adm.), Master of Urban and Regional Planning (M.U.R.P. and Reg.Plan.), Post-Master's Graduate Certificate in Health Care Administration (Grad.Cert. in H.C.A.), Doctor of Business Administration (D.B.A.), and Doctor of Public Administration (D.P.A.)

School of Public and International Affairs: Bachelor of Arts (B.A.), Master of Arts (M.A.), and Master of Science in International Affairs (M.S.




University Buildings




GW
THE GEORGE WASHINGTON UNIVERSITY
NATIONAL LAW CENTER BULLETIN
1979-1980



THE GEORGE WASHINGTON UNIVERSITY CAMPUS | WASHINGTON, D.C.

THE GEORGE WASHINGTON UNIVERSITY
NATIONAL LAW CENTER BULLETIN
July, 1979

Published by The University at Washington, D.C. 20052

THE GEORGE WASHINGTON UNIVERSITY

NATIONAL LAW CENTER BULLETIN

1979–1980

WASHINGTON, D.C. 20052

CONTENTS

Page

4 Calendar
7 The National Law Center
9 The National Law Center Complex
11 The Juris Doctor Degree Program
18 Joint Juris Doctor—Master's Degree Program
18 Master's and Doctoral Programs
22 Degree Programs for International Students
25 Unclassified Students
25 Continuing Legal Education
27 General Information
27 Admission
29 Registration
30 Fees and Financial Regulations
34 Financial Aid
36 Prizes
37 Regulations
44 Center for Academic and Administrative Computing
45 Student Services
48 Courses of Instruction
48 Courses for Juris Doctor Candidates
58 Advanced Courses
80 Special Programs in Research and Instruction
82 The George Washington Law Association
84 The University
85 Board of Trustees
87 Officers of Administration
89 Faculty and Staff of Instruction
96 Summary of Registration, Fall Semester 1978
97 Index

THE CALENDAR 1979–80*

JUNE 1979

S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

JULY 1979

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

AUGUST 1979

S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

SEPTEMBER 1979

S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30						

OCTOBER 1979

S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

NOVEMBER 1979

S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	

DECEMBER 1979

S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

JANUARY 1980

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

FEBRUARY 1980

S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	

MARCH 1980

S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

APRIL 1980

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30			

MAY 1980

S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

1979 SUMMER TERM

May 21	Registration for all sessions *Monday* (noon–6:30 p.m.) Application for September 30 graduation due as part of registration
May 22	First-session and 13-week session classes begin *Tuesday*
May 28	Holiday *Monday*
July 3	First-session classes end *Tuesday*
†*July 4*	Holiday *Wednesday*
July 5, 6, 7	First-session examination period *Thursday–Saturday*
July 9	Registration (9:30 a.m.–2 p.m. and 4–6 p.m.) and [illegible] of classes, second session *Monday* Application for September 30 graduation due as part of registration
August 15	Last day of classes *Wednesday*
August 16, 17, 18	Second-session and 13-week session examination period *Thursday–Saturday*

* This calendar is subject to change

† Courses in the 13-week session will meet on their regularly scheduled days during the [illegible] July 1, excluding the holiday on Wednesday, July 4.

1979 FALL SEMESTER

August 23–24 Registration *Thursday* (12:30-7 p.m.) and *Friday* (3-7 p.m.)
Application for February graduation due as part of registration

August 27 Classes begin *Monday*

September 3 Labor Day (holiday) *Monday*

October 5 S.J.D. dissertations of February candidates due *Friday*

November 21 Thanksgiving recess begins after last class *Wednesday*

November 26 Classes resume *Monday*

December 7 LL.M. theses of February candidates due *Friday*

December 8 Last day of fall-semester classes *Saturday*

December 10–21 Reading and examination period

1980 SPRING SEMESTER

January 3–4 Registration *Thursday* (12:30-7 p.m.) and *Friday* (3-7 p.m.)
Application for May graduation due as part of registration

January 7 Classes begin *Monday*

January 25 S.J.D. dissertations of May candidates due *Friday*

February 18 Winter Convocation (holiday) *Monday*

March 3 Application for 1980–1981 teaching fellowships due *Monday*

March 22 Spring recess begins after last class *Saturday*

March 31 Classes resume *Monday*

April 25 Last day of spring-semester classes *Friday*

April 26–May 9 LL.M. theses of May candidates due
Reading and examination period

May 18 Commencement *Sunday*



THE NATIONAL LAW CENTER

HISTORY

THE LAW CENTER, the oldest law school in the District of Columbia, was established in 1865 with a formal program of two years of study. This was largely through the efforts of the Reverend George Whitefield Samson, President of Columbian College, whose action resulted in the purchase of a separate building for holding law classes. The building had belonged to Trinity Church, of which Francis Scott Key had been Senior Warden. It was occupied by the Law Center until 1884.

Sixty graduates, from 22 of the then 37 states, received degrees in 1867. The school continued to have a student body and a faculty which reflected the fact that it was at the seat of our nation's government. Associate Justices David J. Brewer and John Marshall Harlan of the Supreme Court of the United States were among the prominent members of the bench and bar who were on the faculty.

In 1877, one year after the first such program was adopted in the United States, the Law Center instituted a course leading to the degree of Master of Laws. In 1898, the course of instruction for the degree of Bachelor of Laws was extended to three years. The Law Center took part in 1900 in the organization of the Association of American Law Schools.

In the past quarter-century the Law Center expanded its course and seminar offerings with consideration of the needs of first-degree and graduate students. The degree of Doctor of Juridical Science was instituted in 1940. The need of foreign lawyers who came to this country and who required additional preparation for law work in the United States resulted in the creation of programs for the degrees of Master of Comparative Law in 1946 and Master of Comparative Law (American Practice) in 1951.

In 1954, National University School of Law, which had an important place in legal education in the District of Columbia since 1869, was absorbed by the George Washington University Law School.

Since 1954, programs of special research and study have enriched the basic curriculum. These include the Environmental Law Program; Patent Law Program; International Law Program; the Government Contracts Program; and the Law, Science, and Technology Program.

Additionally, the Law Center has been a leader in developing a curriculum to meet the legal needs of the poor and the disadvantaged. A clinical law program has been developed which is the equal of that at any law school in the nation. Special projects include the Consumer Protection Center, the George Washington Legal Aid Bureau, and individual projects supervised by the Law Students Civil Rights Research Council.

Realizing the need for legal services for all members of society, the National Law Center, while maintaining its strong course offerings in patent law, administrative law, and corporate law, has developed a rich selection of courses in poverty law covering sales, civil rights, and welfare.

Alumni of the National Law Center have included United States Sena Congressmen, Ambassadors, and Cabinet Members. Its graduates have on to become members of both the federal and state judiciaries as we noted members of the bar of every state in the union.

UNIVERSITY POLICY ON EQUAL OPPORTUNITY

George Washington University does not discriminate against any person on basis of sex, race, color, religion, national origin, or handicap in any of its cation programs or activities. Federal regulations implementing Title IX of Education Amendments of 1972 and Section 504 of the Rehabilitation Act 1973 call for an explicit statement that the requirement not to discrimina the basis of sex or handicap extends to employment in and admission to programs and activities. The University is also subject to the District of lumbia Human Rights Law.

Inquiries concerning the application of this policy and federal laws and re lations concerning discrimination in education or employment programs activities may be addressed to Marianne Phelps, Assistant Provost for Affi ative Action, Rice Hall, Washington, D.C. 20052, or to the Director of t Office for Civil Rights of the Department of Health, Education, and Welf

LOCATION IN THE NATION'S CAPITAL

Of special significance is the location of the National Law Center in the tion's capital, the focal point of the law in action, both American and inter tional. The work of the Center goes on in this environment, presenting unique opportunity for observation and study of federal agencies— judicial, islative, and administrative. Readily accessible are the Supreme Court of United States, the federal trial and appellate courts of the District of Colu and, in addition, federal courts of special jurisdiction, such as the United St Court of Claims, the United States Court of Customs and Patent Appeals, Tax Court of the United States, and the Court of Military Appeals. Cur federal legislation can be studied as it is considered by Congressional comm tees and as it comes up for debate on the floors of the House of Represen tives and the Senate. With respect to the federal administrative agencies, dents here in Washington have matchless opportunities for study and obser tion. They can attend informal and formal hearings of these agencies and obtain from the docket sections complete records of administrative adjudicati in specific cases. Illustrative of such federal agencies are the Interstate Co merce Commission and the Civil Aeronautics Board in the field of transpo tion; the Federal Trade Commission in the field of trade regulation; the Sec ties and Exchange Commission in the field of security issues and corpo finance; the National Labor Relations Board in the field of labor-man relations; the United States Patent Office in the field of patent law; the Fed Power Commission in the field of water, natural gas, and electric power the Federal Communications Commission in the field of radio and televis

Supplementing these environmental advantages of law in action are the ceptional research library collections in the Library of Congress, in the departments of the federal government, and in the libraries of the headq

of national and international organizations. The notable library of the Carnegie Foundation for International Peace has been acquired by George Washington University for use of research students in international and comparative law, fields with respect to which Washington has come to be called "The Capital of the World."

The years of residence at law school are years of participation in the life of the community, which in the case of the George Washington University National Law Center is the government of the United States. As a consequence, the study of law takes on added meaning, whether the goal be government service or practice, general or specialized, and whatever the community in which the student plans to practice.

OBJECTIVES

The purpose of the National Law Center is to prepare men and women to meet the needs of society in many fields of law and to encourage scholarly research and writing in the law. As a national law school, the Center does not emphasize any particular geographic area in its instruction; therefore, it prepares students to practice law in any part of the country. The Center also offers a program of legal education for foreign students. The Law Center seeks to fulfill these objectives through (1) a rich and varied curriculum taught by eminent professors and highly qualified specialized instructors; (2) an extensive clinical law program in which students learn legal skills by actual practice; (3) two law journals which specialize in public law and international law; (4) trial practice; (5) participation in the Van Vleck Appellate Case Club (a moot court competition); (6) a series of student professional co-curricular activities; (7) studies on an advanced level for foreign as well as for American students; (8) a continuing legal education program for members of the bar; and (9) scholarly research and writing in the law.

The National Law Center Complex

The National Law Center Complex consists of three buildings, Stockton Hall, Bacon Hall, and the Jacob Burns Law Library.

STOCKTON HALL

Stockton Hall is the main classroom building. It also holds faculty offices and the offices of the Dean and the Associate Deans of the Law Center, as well as the Records Office and student lounges.

BACON HALL

Bacon Hall houses faculty offices; student lounges; the *George Washington Law Review* Office; the Government Contracts Program; the Admissions Office; the Law Center Placement Office; the offices of the *Journal of International Law and Economics*; the Black America Law Student Association; the Law Students Civil Rights Research Council; the Van Vleck Appellate Case

Club; the *Advocate*, the law school newspaper; the Student Bar Association; th Consumer Protection Center; the Legal Aid Bureau; and Movimiento Leg Latino, the national Latino law students association.

THE JACOB BURNS LAW LIBRARY

The Law Library of more than 220,000 volumes, including microform holdings, is housed in the modern Jacob Burns Law Library Building, adjoin ing Stockton Hall on the south side. This facility comprises nine floor and deck levels with about 49,000 square feet of floor space. Its shelf capacity accom modates over 185,000 volumes; with supplementary shelving in Stockton Hall a small branch of the *Law Review* in Bacon Hall, and substantial storage space



in Lisner Hall, the library provides space for almost 300,000 volumes. Seating for more than 500 readers is provided in four reading rooms, lounge areas, carrels, enclosed study cubicles, semi-private reading alcoves, and seminar rooms.

The collections comprise a comprehensive working library of Anglo-American law, with supplementary material in related disciplines (such as business, finance, labor relations, sociology, criminology, political science, biography, foreign affairs, and others). Special areas are maintained for collections in tax law, labor law, patent-trademark-copyright law, international law, and foreign and comparative law. Included in the collections are the appellate decisions of all states courts and decisions of the federal courts, with comprehensive collections of English and Canadian court decisions; the currently annotated statutes of the 50 states; all federal statutes; English and Canadian statutes; selected statutes of other nations; and an extensive periodical collection, kept current by more than 1,100 subscriptions, covering virtually all American legal periodicals and most of those published in English throughout the world. The library is strong in its treatise holdings, administrative and regulatory materials, and Congressional coverage. The growing international law holdings include collections of United Nations and European Economic Community printed material, all recent material from the International Labor Organization, and current and retrospective collections of international treaties. A large portion of the holdings of the former library of the Carnegie Endowment for International Peace, acquired by the University in 1950, is in the Law Library. A LEXIS terminal, providing computer-assisted research capability, is available to students and faculty.

The Juris Doctor Degree Program

ENTRANCE REQUIREMENTS

For information on "Application for Admission" to the Juris Doctor degree program, see page 28. Admission to candidacy for the degree of Juris Doctor requires a Bachelor of Arts or equivalent degree from an accredited college or university, a satisfactory quality of work, and an acceptable distribution of courses. Any substantial number of hours taken on a pass-fail or other ungraded basis may be seriously detrimental to an applicant's chances for admission. Eligibility is based on personal and scholastic records and on the result of the Law School Admission Test. Personal recommendations by the faculty, as well as the benefits the school derives from social, ethnic, cultural, and geographical diversity among its students, are considered. No applicant will be acceptable in transfer who is ineligible to return in good standing to a previously attended law school. From the applicants, a selection is made by the Committee on Admissions.

Information concerning the Law School Admission Test may be obtained from the Admission Office of the National Law Center or from the Educational Testing Service, 20 Nassau Street, Princeton, N.J. 08540; or 1947 Center Street, Berkeley, Calif. 94704. The test is administered at various centers in the United States. Testing dates are usually in October, December, February, April, and June. Completed application forms and fees must be received by

the Educational Testing Service at least four weeks before the date of the test. It is not necessary that formal application for admission be made prior to taking the test.

ADVANCED STANDING

In unusual circumstances, advanced standing toward the degree of Juris Doctor may be granted for work of high quality successfully completed in other law schools which are members of the Association of American Law Schools or are approved by the American Bar Association. Transferred credits will not be recognized in excess of those which might be earned in a similar period in the National Law Center.

Advanced standing will not be granted for law work already counted toward the Bachelor of Arts or other pre-legal degree.

TUITION DEPOSIT

Every student admitted to the National Law Center as a candidate for the degree of Juris Doctor must submit a tuition deposit ($100 initially plus $350 later) after receipt of notification of acceptance. This deposit is credited toward tuition.

PROFILE OF THE ENTERING CLASS, FALL 1978

A first-year class of approximately 400 students was selected from more than 5,000 applicants from 700 colleges and universities. Applications were received from every state in the union. Thirty-seven per cent of the first-year class were women.

The following colleges and universities are each represented by three or more members of the first-year class: American University, Boston University, Brandeis University, Brown University, Bucknell University, Catholic University of America, City University of New York (Brooklyn College and Queens College), Colgate University, Columbia University, Cornell University, Dartmouth College, Dickinson College, Duke University, Emory University, Fordham University, Franklin and Marshall College, George Washington University, Georgetown University, Hamilton College, Harvard University, Haverford College, Johns Hopkins University, Marquette University, Miami University, Michigan State University, Northwestern University, Oberlin College, Ohio State University, Pennsylvania State University, Princeton University, Rutgers University, Smith College, Stanford University, State University of New York at Albany, State University of New York at Binghamton, State University of New York at Buffalo, Syracuse University, Temple University, Trinity College (Connecticut), Tufts University, Tulane University, University of California, Berkeley, University of Chicago, University of Connecticut, University of Denver, University of Florida, University of Hawaii, University of Illinois, University of Maryland, University of Michigan, University of North Carolina, University of Notre Dame, University of Pennsylvania, University of Pittsburgh, University of Rochester, University of Texas, University of Utah, University of Virginia, University of Wisconsin, U.S. Military Academy, U.S. Naval Academy, Vassar College, Washington University, Wellesley College, Wesleyan University, Williams College, Yale University.

THE CURRICULUM

The curriculum for the degree of Juris Doctor at the National Law Center offers the candidate one of the largest and most varied selections of courses in the country. First-year students are required to take courses entitled Civil Procedure; Constitutional Law; Contracts; Criminal Law and Procedure; Legal Research, Writing, and Professional Responsibility and Ethics; Property; and Torts. These courses give students the basis upon which all further legal study is built. In the second and third years of study, students must take Evidence and fulfill a two-credit legal writing requirement. Beyond these requirements the students are free to choose from the many course and project offerings. The Law Center prides itself on allowing students freedom to design their own program of study.

The curriculum is organized so that students may begin the study of law for the Juris Doctor degree only at the start of the fall semester. Transfer students may enter at the start of the spring semester also.

Day Division

First Year

FALL SEMESTER		SPRING SEMESTER	
Contracts I	4	Contracts II	2
Torts	4	Property	4
Criminal Law and Procedure	4	Constitutional Law	4
Legal Research, Writing, and Professional Responsibility and Ethics	2	Civil Procedure	4
Total semester hours	14	Total semester hours	14

Second Year

FALL SEMESTER		SPRING SEMESTER	
Elective	14	Evidence	4
		Elective	10
Total semester hours	14	Total semester hours	14

Third Year

FALL SEMESTER		SPRING SEMESTER	
Elective	12	Elective	14
*Legal writing requirement	2		
Total semester hours	14	Total semester hours	14

* This requirement may be satisfied by service on the *Law Review*, by satisfactory completion of a seminar which requires a research paper, or by satisfactory completion of Law 344, *Legal Writing*.

Evening Division

First Year

FALL SEMESTER		SPRING SEMESTER	
Contracts I	4	Contracts II	4
Torts	4	Criminal Law and Procedure	4
Legal Research, Writing, and Professional Responsibility and Ethics	2	Civil Procedure	2
Total semester hours	10	Total semester hours	10

Second Year

FALL SEMESTER		SPRING SEMESTER	
Property	4	Constitutional Law	4
Elective	6	Elective	6
Total semester hours	10	Total semester hours	10

Third Year

FALL SEMESTER		SPRING SEMESTER	
Elective	8	Evidence	4
*Legal writing requirement	2	Elective	6
Total semester hours	10	Total semester hours	10

Fourth Year

FALL SEMESTER		SPRING SEMESTER	
Elective	10	Elective	10
Total semester hours	10	Total semester hours	10

Summer Term or Ninth Semester

Elective 4

REQUIREMENTS FOR THE DEGREE

The student must have completed a residence period of three academic years (four years for evening students) and 84 semester hours of required and elective courses, with a cumulative average of at least 65. At least one academic year of residence and 28 semester hours are required of students admitted with

* This requirement may be satisfied by service on the *Law Review*, by satisfactory completion of a seminar which requires a research paper, or by satisfactory completion of Law 344, *Legal Wri*

advanced standing. The work of the final semester or summer session must be completed while in residence at the National Law Center. Credits allowed for advanced standing are not included in computing the average required for graduation.

Graduation Requirements.—See page 42 for a statement of the graduation requirements.

Residence

Candidates for the Juris Doctor degree must complete a residence period of three academic years. Attendance in the day division for the fall and spring semesters constitutes residence for an academic year; similar attendance in the evening division constitutes residence for three-fourths of an academic year. Consequently, a day student must attend six semesters to meet residence requirements; an evening student must attend eight. Students authorized to take schedules of less than 10 hours in the day division or less than six hours in the evening division receive residence credit on a proportional basis. Students who attend the summer sessions receive fractional residence credit.

HONORS

The degree of Juris Doctor "With Highest Honors" is awarded to those students, not exceeding three per cent of the graduating class, who have obtained the highest cumulative averages of at least 85 or better.

The degree of Juris Doctor "With High Honors" is awarded to those students with the highest cumulative averages of 80 or better. The number of students receiving degrees "With High Honors," when added to the total number of students receiving degrees "With Highest Honors," may not exceed 10 per cent of the graduating class.

The degree of Juris Doctor "With Honors" is awarded to those students with the highest cumulative averages of 75 or better. The number of students receiving degrees "With Honors," when added to the total number of students receiving degrees "With High Honors," and "With Highest Honors," may not exceed 40 per cent of the graduating class.

ORDER OF THE COIF

The Order of the Coif, a national legal honor society, aims "to foster a spirit of careful study and to mark in a fitting manner those who have attained a high grade of scholarship." The George Washington University Chapter was established in 1926. Members are elected each year from the highest-ranking 10 per cent of the graduating Juris Doctor candidates.

PUBLICATIONS

The *George Washington Law Review*, published five times a year, is edited and managed by the students of the National Law Center. The *Law Review* is known for its emphasis on federal and public law; however, it is also de-

voted to research in other important legal areas. The staff of the *Law Re* is selected on the basis of a writing competition and on the basis of gra The editorial board is selected from those students who have successfully co pleted the first year of *Review* work. Students receive 4 semester hours academic credit for the two-year program.

The *Journal of International Law and Economics*, managed and edited law students, is a biannual publication of the Law Center. It presents art and commentaries on public and private international financial developm comparative law, and international law. The staff of the *Journal* is sele through a writing competition, and students earn academic credit for th work.



MOOT COURT

The Van Vleck Appellate Case Club provides realistic training in appellate oral advocacy for students in the National Law Center. Each year two competitions are held: the upperclass competition is held in the fall and the first-year competition is held in the spring.

LAW CENTER ORGANIZATIONS

Black America Law Student Association (BALSA)

The Black America Law Student Association is a national Black law students organization which has chapters at some 80 law schools. BALSA sponsors law speakers and various programs.

International Law Society

The International Law Society is an organization of students interested in the practice of international law. The Society sponsors speakers and various programs.

Movimiento Legal Latino

A national Latino law students organization which has chapters at various law schools, Movimiento Legal Latino sponsors law speakers and various programs.

Law Fraternities and Sororities

The chapters of Beta Kappa Pi, Delta Theta Phi, Phi Alpha Delta, and Phi Delta Phi at the National Law Center sponsor speakers and various social occasions.

Law Students Civil Rights Research Council (LSCRRC)

The Law Students Civil Rights Research Council is a national organization of law students concerned with the legal problems of civil rights. LSCRRC offers clinical law projects for which students may receive academic credit.

National Lawyers Guild

The George Washington Chapter of the National Lawyers Guild is designed to bring together those lawyers committed to broad issues of social reform.

Student Bar Association

The Student Bar Association is the law student governing body, responsible for allocating funds among the various student organizations. It also conducts a speaker program for the law school. All members of the student body are members of the Student Bar Association.

Student Patent Law Association (SPLA)

The Student Patent Law Association, an organization of students interested in patent and related law, conducts an extensive speakers program as well as various social events.

Women's Rights Committee (WRC)

The Women's Rights Committee is primarily interested in the place of wo in law schools and in the legal profession. WRC conducts seminars and sp sors speakers.

Joint Juris Doctor—Master's Degree Program

In certain instances, arrangements may be made for students to work conc rently toward both the Juris Doctor degree in the National Law Center and Master's degree in some fields in the University's Graduate School of Arts Sciences, School of Government and Business Administration, or School Public and International Affairs. Fields in which this program is available clude Business Administration, Economics, International Affairs, Po Science, Public Administration, and Public Affairs. Students must be adm both to the National Law Center and, separately, to the School which confer the Master's degree, and must meet all requirements in each degree gram. It is possible for a student to complete work for both degree progra within four years.

Master's and Doctoral Programs

THE ADMINISTRATION OF JUSTICE under law is a matter so vast and comple that some who hold the Bachelor of Laws or Juris Doctor degree feel the need for further study. The Master's and doctoral programs give students the opportunity to broaden and deepen their understanding of the law.

The Master of Laws candidate may follow a program of general study concentrate in one of the specialized areas listed below. Courses in each these areas are included in the 401–600 series. Graduates who complete the work in one of these areas may have the field of specialization noted on the diplomas.

Administrative Law: Economic Regulation
Corporation Law
Environmental Law
Government Procurement Law
International and Comparative Law
Labor Law
Land Use Management and Control
Law and Poverty
Law, Psychiatry, and Criminology
Law, Science, and Technology
Patent and Trade Regulation Law
Taxation
Urban Legal Studies

Programs leading to the degree of Doctor of Juridical Science offer a limited number of unusually talented advanced students, who have already earned the Master of Laws degree, the opportunity to concentrate on research and writing in a specific area of interest to the legal profession.

MASTER OF LAWS

Entrance Requirements

A Bachelor of Laws, Juris Doctor, or equivalent degree from a law school which is a member of the Association of American Law Schools or is approved by the American Bar Association is required. The applicant must have demonstrated a high degree of academic excellence. Advanced standing is not granted for credits earned while a candidate for the first degree in law or for credits earned at other law schools.

Degree Requirements

The student must complete a residence period of not less than two semesters, which should be continuous. All requirements for the degree must be completed in this Law Center and in a period not exceeding three years from the time of initial graduate registration, unless an extension is granted in writing by the Dean. The student must complete 24 semester hours of courses and writing projects with acceptable grades. For all courses taken within the Law Center a student must attain the grade of 65 or above. For approved courses taken outside the Law Center, the grade of either *CR* (Credit) or *NC* (No Credit) is assigned. To receive the grade of *CR* (Credit) in a course taken in other graduate divisions of this University, a student is required to attain the grade of *B* or better. To receive the grade of *CR* (Credit) in a course taken at Georgetown University through the Consortium of Universities of the Washington Metropolitan Area, Inc., a student is required to attain the grade of 80 or better. A minimum cumulative average of 78 is required at all times for all LL.M. candidates admitted or readmitted after February 1976, or completing their degree requirements after February 1979. For candidates registered prior to February 1976, and continuously registered since, who receive their degree on or before February 1979, the minimum cumulative average is 75. The student is expected to include Law 599–600 *Thesis* in the 24-semester-hour requirement for the degree (for exception, see "Master's Thesis," below).

Candidates for the degree in a selected field of specialization must complete a minimum of 12 of the required 24 semester hours in courses and writing projects related to the selected field. Each Master of Laws program of study may include a limited number of courses numbered in the 300 series, with the approval of the Dean.

The only credit hours that may be applied to any Post-J.D. degree are those completed while a duly enrolled candidate for that specific degree, with the following exceptions: (1) an unclassified student who has been admitted with the specific right to convert to degree status at the end of a specified number of hours, and (2) S.J.D. candidates who have fulfilled the 8-hour course requirement as unclassified students.

MASTER'S THESIS

Each candidate for the degree of Master of Laws is expected to write a Master's thesis (Law 599–600) under the supervision of a full-time member of the faculty of the National Law Center. Four hours of credit will be granted for

recommendation and may either accept or reject the applicant as an S.J.D. candidate. In no instance will any applicant be admitted to degree candidacy prior to the above procedures; however, the applicant may be registered as an Unclassified Student for purposes of course work requirements (see below). Approval for degree candidacy must be received within one year of the appointment of an adviser unless a written extension is granted by the Dean.

Degree Requirements

The candidate must complete (1) a residence period of not less than one academic year; (2) a course of study and research—designated by the consultative committee and approved by the Graduate Board—of no less than [illegible] semester hours including *Jurisprudence*, unless previously taken; and (3) an acceptable dissertation. The dissertation must be submitted no later than three years from the date of admission to candidacy for the S.J.D. degree. The applicant who proposes to write on a comparative law topic must have a reading knowledge of the language in which the relevant materials are to be found. When the dissertation is submitted, the consultative committee will set the date for an oral examination. This examination is conducted by the consultative committee and such other members of the faculty and qualified experts as are selected by the Graduate Board.

No later than the date specified in the Calendar (see page 5), the candidate must submit to the Dean two complete copies of the dissertation and two copies of an abstract (not to exceed 600 words) of his dissertation.

Printed copies of detailed regulations regarding the form and reproduction of the dissertation and preparation of the abstract are available in the Office of the Dean. To be acceptable the dissertation must, in the opinion of the examining committee, constitute a substantial contribution to the field of law concerned and be suitable for publication. Additional information will be supplied by the Dean. Accepted dissertations become the property of the University and are placed in the University Library and the Law Library, where the duplicate copies are bound and made available for circulation.

Degree Programs for International Students

THE NATIONAL LAW CENTER has several programs of study available to students trained in law outside the United States. These programs fall into two general categories: (1) those directed toward preparing students for a bar examination in an American jurisdiction and (2) those that enable students to return to their countries with a more thorough understanding of some aspects of American law.

A student with a degree from a foreign law school who has met the extremely competitive admissions criteria will be admitted to the Center as a candidate for the Master of Comparative Law (Foreign Practice) (M.Comp.L. [For. Prac.]) or Master of Comparative Law (American Practice) (M.Comp.L. [Am. Prac.]) degree.

To prepare for admission to the bar of an American jurisdiction, the student may apply for either the Juris Doctor or the Master of Comparative Law (American Practice) degree. The J.D. degree requires 84 semester hours of



work in law school (credit is given for work in a foreign law school only in exceptional circumstances) and will qualify the student to take most U.S. bar examinations. *Students are cautioned to ascertain the requirements of the bar for which they intend to qualify prior to selection of their law school programs.*

Foreign students planning to return to their home countries may undertake a program leading to the degree of Master of Comparative Law (Foreign Practice). This degree program enables the student to gain a broader comprehension of the American legal system by taking basic courses in the Law Center. However, it is not intended to qualify a student to take a U.S. bar examination.

ADMISSION PROCEDURE

Application must be received from *foreign applicants* no later than June 1 for the fall semester (March 1 for candidates for the Juris Doctor degree), November 1 for the spring semester, and March 1 for the summer sessions.

Required Records

Applicants must request all educational institutions attended to send directly to the Dean official credentials listing subjects studied, grades received, examinations taken, and degrees received. Original diplomas, certificates, and transcripts from secondary schools and all colleges and universities attended

are required, but in exceptional cases certified copies will be accepted. Record of state examinations and certificates are also needed. All records become the property of the University and *cannot* be returned.

Language Test

Students whose native tongue is not English are required to take the *Test of English as a Foreign Language* and attain as an absolute minimum the score of 550 to be considered for admission to the National Law Center. This is a mandatory requirement. Students are responsible for making arrangements for taking the test and should address inquiries to TOEFL, Educational Testing Service, Princeton, New Jersey 08540, U.S.A. The completed application form should be returned to the Testing Service at Princeton well in advance of the beginning of the semester for which the applicant seeks admission. The test fee, which should be remitted with the application, entitles the student to have the test score sent to three different institutions. Registration for the *Test of English as a Foreign Language* does *not* constitute application for admission to George Washington University.

The Bulletin of Information, obtainable without charge, contains a description of the test as well as rules regarding application, fees, reports, and the conduct of the test; lists of examination centers; examination dates; and an application blank. On the application for the test, the student should specify that the scores be sent to the Dean's Office.

ENTRANCE REQUIREMENTS

For the Degree of Juris Doctor.—Entrance requirements for foreign students are the same as those stated on page 11, except that advanced standing is rarely granted for study in foreign law schools.

For the Degrees of Master of Comparative Law (Foreign Practice) and Master of Comparative Law (American Practice).—The entrance requirements are the successful completion of and graduation from a course in arts, philosophy, letters, or sciences, equivalent to graduation from a gymnasium, lycee, or liceo, and graduation in law with high academic standing from a recognized foreign university.

For the Degree of Master of Laws.—A foreign student will only be considered for admission to the Master of Laws program if he or she has a juris doctor or post-juris doctor degree in law with high academic standing from an American university.

For the Degree of Doctor of Juridical Science.—The usual entrance requirements are the successful completion of and graduation from a course in arts, philosophy, letters, or sciences, equivalent to graduation from a gymnasium, lycee, or liceo; graduation in law from a recognized foreign university; outstanding capacity for scholarly work in the field of law; and a Master of Laws degree with high academic standing from an American university.

DEGREE REQUIREMENTS

Juris Doctor, Master of Laws, Masters of Comparative Law, and *Doctor of Juridical Science.*— Degree requirements for foreign students are the same as those stated on pages 14–15, 19–20, and 22.

Master of Comparative Law (Foreign Practice).—The student must complete a residence period of not less than two semesters, which should be continuous. All requirements for the degree must be completed in a period not exceeding three years from the time of registration for the degree. The student must complete satisfactorily 24 semester hours of approved courses of the Center, or of such other departments of the University as the faculty of the Center shall approve, and must maintain a cumulative average of at least 55. A cumulative average of 65 is required for those admitted after the spring semester 1977.

Master of Comparative Law (American Practice).—The requirements for this degree are the same as those for the degree of Master of Comparative Law (Foreign Practice) except that this degree requires 28 semester hours of course work with a cumulative average of at least 65. For those students admitted for or after the 1979 Fall semester, 32 semester hours of course work with a cumulative average of at least 65 will be required.

Unclassified Students

TWO TYPES OF STUDENTS may be admitted to the National Law Center as Unclassified Students, in accordance with the following regulations:

1. A candidate for a Bachelor of Laws or Juris Doctor degree with an above-average record at another law school which is a member of the Association of American Law Schools or is approved by the American Bar Association, may at the discretion of the Dean, be admitted as an Unclassified Student to earn credits for transfer to the other law schools. Such students are normally admitted only to the summer sessions. They are admitted to the fall or spring semester only in unusual circumstances.

2. Graduates of law schools which are members of the Association of American Law Schools or are approved by the American Bar Association who wish to take advanced courses without pursuing degree programs may be admitted as Unclassified Students.

Unclassified Students participate in the work of the course, take examinations, and have their grades recorded. Credit for work earned as an Unclassified Student may not be applied to satisfy the requirements for a degree program unless express written approval is granted by the Dean at the time of admission.

Continuing Legal Education

MEMBERS OF THE BAR wishing to keep abreast of current developments in the law may register for any of the courses in the National Law Center on a non-credit basis as Continuing Legal Education students. Such students do not take examinations in courses and no grades are recorded for their work.

A simplified admission and registration procedure is used and must be completed on or before the last day of regular registration for the appropriate semester. Continuing Legal Education students pay only the tuition fee on the semester-hour basis. They may not participate in student activities or benefit from the medical privileges of the University. (Continuing Legal Education registrations are subject to cancellation if courses are filled by regularly registered students.)



GENERAL INFORMATION

THE NATIONAL LAW CENTER has an enrollment of about 1,700 for the J.D. and Post-J.D. degree programs. Approximately 1,000 students are enrolled in the full-time day division for the J.D. degree and 400 are enrolled in the part-time evening division. Three hundred students, many from abroad, are enrolled in the Post-J.D. degree programs.

DAY AND EVENING CLASSES

Day classes meet in the mornings in 50-minute periods and in the afternoons in 75-minute periods and also in sessions of two 50-minute periods, Monday through Friday. Trial Practice Court and certain other courses meet for two-hour periods on Saturday mornings.

Evening classes meet from 5:50 to 7:40 p.m., Monday through Friday. A four-credit course, e.g., Evidence, meets two evenings a week; a three-credit course, e.g., Administrative Law, meets two evenings a week for one-half the semester and one evening for the other half; a two-credit course, e.g., Contracts I, meets one evening a week. The evening division conforms to the standards of the day division, the full-time faculty participating in the instruction.

Examinations for both day and evening classes may be given in the afternoon only. Examinations for day students may be given in the evening.

SUMMER TERM

A term of two sessions, with day and evening classes, is offered in the summer. Students may register for either or both sessions. *No beginning students are admitted to the Juris Doctor program in the summer term.*

The summer term is shorter than a semester of the academic year, and, as a consequence, a student must attend two and one-half summer terms to receive residence credit for one academic year or attend one and one-half summer terms to receive residence credit for a semester.

A maximum of 6 semester hours may be taken each session by day students. Day students receive four-tenths of a semester of residence credit for each session of the summer term in which they are registered for 3 or more semester hours. A maximum of 4 semester hours may be taken each session by evening students. Evening students receive three-tenths of a semester of residence credit for each session of the summer term in which they are registered for 2 or more semester hours.

Admission

APPLICANTS ARE URGED to submit application forms and complete credentials well in advance of the semester for which they seek admission. In the selection process, there is no discrimination against any applicant because of sex, race, color, religion, handicap, or national origin. An application fee of $25 for a degree candidate ($5 for an unclassified student) must accompany the application.

Forms for application for admission or readmission are available at ... should be returned to the Office of Admissions of the National Law Cen... George Washington University, Washington, D.C. 20052.

For further details concerning students from foreign institutions, see pa... 22–25.

APPLICATION FOR ADMISSION

Juris Doctor Program.—Beginning students are admitted only at the start ... the fall semester.

The applicant should register with the Law School Data Assembly Servic... (LSDAS) by completing and mailing the registration form supplied with ... application blank. No application to this school will be processed unless ... companied by a Law School Application Matching Form, which is found ... each applicant's LSAT/LSDAS registration packet. Since an LSAT and ... LSDAS report cannot be produced by Educational Testing Service without ... Matching Form, it will be necessary to return to the applicant any appli... received without it. A transcript from each college or university attended sho... then be sent directly to LSDAS, Educational Testing Service, Box 944, Prin... ton, New Jersey 08540. No transcript should be sent to the National L... Center. The LSDAS will analyze the transcript and send a copy to this ... school and others designated on the registration form. If the transcript w... has been forwarded to LSDAS does not show evidence of receipt of a Bac... lor's degree, the applicant will be asked, upon acceptance, to submit a ... transcript directly to the National Law Center.

To provide time for the evaluation of credentials of beginning students, ... papers, including the Law School Admission Test score, should be received ... the National Law Center before March 1. This means that the October or De... cember Law School Admission Test should be taken (see "Entrance Requ... ments," page 11).

All papers of transfer students should be received by the Admissions Offi... no later than June 2 for the fall semester, December 3 for the spring semester, ... May 1 for the first summer session, and June 2 for the second summer ses... sion.

For additional information, see the official *Pre-Law Handbook, 1979–198...* edition, available in October 1979, and prepared by the Law School Admissio... Council and the Association of American Law Schools. This book contains ... material on the law and lawyers, pre-law preparation, applying to law schools, ... and the study of law, together with individualized information on most Amer... can law schools. It may be obtained at college bookstores or ordered from ... Educational Testing Service, Princeton, New Jersey 08540.

Master's and Doctoral Programs.— Students are admitted at the beginning of ... the fall semester, the spring semester, or any of the summer sessions.

Application for admission, together with all required credentials, must be ... received by July 1 for the fall semester, November 1 for the spring semes... ter, and one month prior to registration for the summer session for which ap... plication is made.

Unclassified Students.—Lawyers who wish to take graduate courses ... admitted at the beginning of the fall semester, the spring semester, or any of ... the summer sessions. Students who wish to earn credits for transfer toward ...

Bachelor of Laws or Juris Doctor degree at another institution may be admitted to the summer sessions if they are students in good standing at an accredited law school and have shown unusual ability in their law studies; they are admitted to the fall or spring semester only in unusual circumstances.

1. Application for admission, with required credentials, for a student who wishes to earn credits for transfer toward a Bachelor of Laws or Juris Doctor degree at another law school (see page 25), should be received at the Office of Admissions of the National Law Center at least one month prior to the first day of registration for the semester or summer session for which application is made.

2. Application for admission, with required credentials, for lawyers who wish to take graduate courses (see page 25), should be received at the Office of Admissions of the National Law Center by July 1 for the fall semester, December 1 for the spring semester, and one month prior to registration for the summer session for which application is made.

READMISSION

A student who was previously registered but did not attend during the most recent semester (summer term excluded) should file an application for readmission. Closing dates for readmission are the same as those for admission (see "Application for Admission," page 28).

If the student has attended one or more higher institutions during his absence from the University or if he applies as a degree candidate and was previously a nondegree student, he must have complete, official transcripts sent to the Dean.

Registration

BEFORE ATTENDING CLASSES each student must register in person. No student will be registered until proper credentials have been filed and approved (see "Admission").

No registration is accepted for less than a semester or one summer session.

A student may not register concurrently in George Washington University and another institution. Registration in more than one college, school, or division of the University requires the written permission of the deans concerned, *prior to registration.*

ELIGIBILITY FOR REGISTRATION

A student who is suspended or whose record is not clear for any reason is not eligible to register.

New Student.—Upon receipt of a *final letter* of admission a new student is eligible for registration on the stated days of registration.

Readmitted Student.—A student previously registered who was not registered in courses during the preceding semester or summer session must apply for and receive a letter of readmission (see "Readmission," above) before becoming eligible for registration.

DATES AND PLACE OF REGISTRATION

Registration is held in Stockton Hall, 720 Twentieth Street, N.W., during the following periods: *fall semester,* August 23 and 24, *spring semester,* January 3 and 4.

A late-registration fee of $15 is charged each student who is permitted to register after the regular registration days.

Registration may be changed only with the permission of the Dean.

Fees and Financial Regulations

THE FOLLOWING FEES AND FINANCIAL REGULATIONS were adopted for the 1979 summer sessions and the academic year 1979–80. (See page 31 for the projected tuition and fee increases for 1980–82.)

Tuition Fees

For all students except Doctor of Juridical Science candidates:
- Full-time program (11 or more hours*), each semester $2,050
- Part-time program, for each semester hour 165

Doctor of Juridical Science candidates,† including the final examination 4,200

University Center Fee (charged all students registered on campus)

For students registered for 11 or more semester hours:
- Each semester 50.50

For students registered for less than 11 semester hours in a semester:
- For each semester hour for which the student registers .....

Graduation Fees

Juris Doctor, Master's, Doctor's degrees 25.00

Fee for binding Master's Theses and S.J.D. Dissertations 15.00

Special Fees

Application fee (degree candidate), nonrefundable 25.00

Application fee (unclassified student), nonrefundable 5.00

Application fee for room reservation, nonrefundable 100.00

Tuition deposit fee charged each student admitted to J.D. degree candidacy (payable in two installments—$100, nonrefundable, by a date specified in the letter of admission, $350 by June 2) 450

Late-registration fee, for failure to register within the designated period 15.00

Late-payment fee, charged for failure to make payments when due (see "Payment of Fees," below) 15.00

Replacement of lost or stolen picture identification card 5.00

---

* With the prior permission of the Dean, a J.D. degree candidate may take more than 14 semester hours after the first year of study.

† The tuition fee is to be paid at the rate of $1,050 per semester for four successive semesters, exclusive of the summer term or terms. If the Faculty should approve an extension of time, the student must maintain continuous enrollment.

Financial reinstatement fee, for reinstatement after financial encumbrance for nonpayment of fees (see "Payment of Fees," below) 35.00
Returned check fee, charged a student whose check is returned because of insufficient funds or for any other reason 15.00
Transcript fee, for each transcript of record 2.00

Registration on campus in the University entitles each student to the following privileges: the services of the Student and Alumni Career Services Office; the use of the University Library; gymnasium privileges; admission to all athletic contests, unless otherwise specified; subscription to the *University Hatchet*, the student newspaper; admission to University debates; medical attention as described under Student Health Service. These privileges terminate and a student is no longer in residence upon withdrawal or dismissal from the University.

PROJECTED TUITION AND FEE INCREASES 1980–82

In order that students and their parents may plan more realistically, tuition increases for the academic years 1980–81 and 1981–82 have been estimated as follows:

Increase by year (full-time students):

1980–81	$500.00
1981–82	500.00

Increase by semester hour (part-time students):

1980–81	20.00
1981–82	20.00

It is not possible to project future economic data with certainty. The increases outlined above are merely estimates based on present circumstances and should in no way be interpreted as fixed limits on tuition increases. The University hopes to keep tuition increases as low as possible, but it is obligated to maintain a sound financial basis. Economic conditions in the recent past, particularly as they affect private educational institutions, have been extremely variable, and significant increases in tuition in excess of the above limits may be required.

PAYMENT OF FEES

No student is permitted to complete registration or attend classes until all charges are paid. Tuition and fees for each semester are due and payable in full at the Office of the Cashier at the time of each registration. Checks and postal money orders should be made out to George Washington University with student identification number shown in upper left hand corner.

The Student Accounts Office has responsibility for billing and maintaining student accounts for tuition, various fees, and room and board charges. Students registered for 6 semester hours or more may sign a deferred payment contract with the Student Accounts Office at the time of each registration permitting them to pay one-half of the total tuition and fees (except for fees payable in advance) at the time of registration and the remaining half on or before

---

Slight yearly increases are also projected for the total fee for work leading to the degree of Doctor of Juridical Science.

October 24, 1979 (for the fall semester), and March 5, 1980 (for the s semester). Interest at the rate of 8 per cent per annum on the unpaid ba will be charged from the date of registration to the date payment is made.

Students receiving tuition assistance in the form of scholarships, gover tuition contracts, or other forms of tuition awards are not permitted to deferred payment contracts unless the total tuition and fee charges exceed value of the tuition awards by $800 or more. Under such circumstance student may be permitted to pay one-half of the amount due from the st at the time of registration and to defer the balance by signing a deferred ment contract.

Students who fail to make any payment when due will be automatica charged a $15 late-payment fee and will be subject to the interest charge o per cent per annum. Accounts which become 30 days past due will be fin cially encumbered. In the event a student's account is financially encumber the student forfeits his right to the use of deferred payment contracts in semesters, and the Student Accounts Office will notify the Registrar to withh grades, future registration privileges, transcripts, diplomas, and other acade information until the account is settled financially. Financial settlement w quire payment in full of all amounts due the University in addition to a fin cial reinstatement fee of $35.

PREPAID AND DEFERRED PAYMENT PLANS

Several commercial programs for those who wish to pay for college on monthly basis are available. Terms and conditions vary, but most provide life insurance policy in the contract. For specific details and applications, dress inquiries to the following:

1. Girard Edu-Check Plan, 2nd and Chestnut Streets, Philadelphia, P 19106
2. Richard C. Knight Insured Tuition Payment Plan, 6 St. James Avenue Boston, Mass. 02100
3. The Tuition Plan, Inc., Concord, N.H. 03301

The University's Office of Student Financial Aid does not maintain a supply of applications for these various programs, but will be happy to provide ad ance to students and parents.

WITHDRAWALS AND REFUNDS*

Applications for withdrawal from the University or for change in class sc ule must be made in person or in writing to the Dean. Withdrawal fr courses is permitted after the midpoint of a semester only in extraordinary cumstances. Notification to an instructor is not an acceptable notice.

In authorized withdrawals and changes in schedule, cancellations of semes tuition charges and fees will be made in accordance with the following sc ule for the fall and spring semesters:

* No refund of the $100 deposit required of entering students is granted. Regulations covering w drawal and refunds for the summer sessions are stated in the *Summer Sessions Schedule of C*

1. *Complete withdrawal* from the University:

FALL SEMESTER

Withdrawal dated on or before August 24, 1979 .....90 per cent
Withdrawal dated August 27 to September 7, 1979 .....75 per cent
Withdrawal dated September 10 to September 21, 1979 ....50 per cent
Withdrawal dated after September 21, 1979 .....none

SPRING SEMESTER

Withdrawal dated on or before January 11, 1980 .....90 per cent
Withdrawal dated January 14 to January 25, 1980 .....75 per cent
Withdrawal dated January 28 to February 8, 1980 .....50 per cent
Withdrawal dated after February 8, 1980 .....none

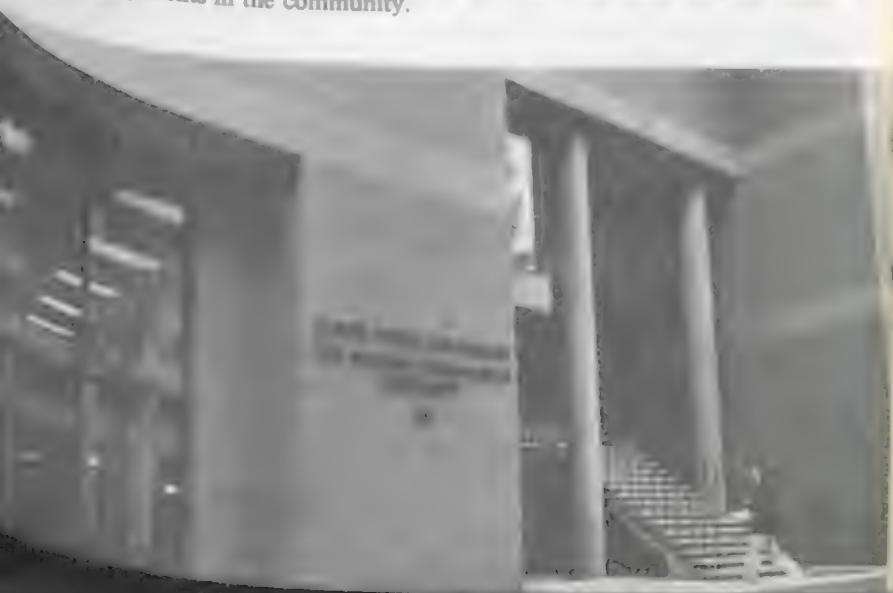
2. For a *change in status from full-time to part-time student* or for *partial withdrawal by a part-time student*, the above schedule applies to the difference in charges between the original program and the adjusted program continuing in effect.
3. A student enrolled in a full-time program who drops or adds a course and continues to be in a full-time program will have no financial adjustments of tuition made other than those involving course fees.
4. Regulations governing student withdrawals as they relate to residence hall and food service charges are contained in the specific lease arrangements.

In no case will tuition be refunded or reduced because of absence from classes.

Payment applies only to the semester for which a registration charge is incurred and will not be credited to another semester.

Authorization to withdraw and certification for work done will not be given a student who does not have a clear financial record.

Students are encouraged to provide their own cash funds until they can make banking arrangements in the community.



Financial Aid

THE NATIONAL LAW CENTER has been able in recent years to assist many students in obtaining the financial aid they require, through full or partial scholarships, various loan programs, part-time employment, or a combination of these kinds of assistance.

GRADUATE AND PROFESSIONAL SCHOOL FINANCIAL AID SERVICE

The National Law Center participates in the Graduate and Professional School Financial Aid Service (GAPSFAS), which provides an analysis of an applicant's financial needs. Entering students wishing to receive financial aid should request the materials from GAPSFAS, Education Testing Service, Box 944, Princeton, New Jersey 08540. The information provided by the applicant and the applicant's parents will be analyzed, and a copy of the report will be sent to the Law Center. In addition, students entering the National Law Center who desire to be considered for a scholarship must submit a letter to the Law Center by March 1 outlining their academic qualifications, their extracurricular activities and their reasons for believing a scholarship award to them is justified.

Students needing financial assistance should file with GAPSFAS in time for their reports to be received at the Law Center as early as possible since the Committee on Student Financial Aid of the Center will begin making awards in March, and available funds are limited.

No awards will be made to an entering student until the admission process has been completed.

JURIS DOCTOR PROGRAM

Scholarships and Research Assistantships

Application and correspondence concerning scholarships and research assistantships should be sent directly to the Dean. Unless otherwise specified, application and supporting credentials should be submitted no later than March 1 preceding the period for which the award is made.

Arent, Fox, Kintner, Plotkin & Kahn Scholarship (1973).—Scholarship aid for needy law students from the Washington, D.C., area.

Mildred Gott Bryan Scholarship Fund (1965).—Partial scholarship aid for students in the National Law Center.

Charles Worthington Dorsey Memorial Scholarship (1947).—Memorial to Charles Worthington Dorsey, LL.B. 1881, LL.M. 1882. A full-tuition scholarship for the course leading to the degree of Juris Doctor, awarded to a needy and promising graduate of this University with a Bachelor of Arts or equivalent degree. Ordinarily this scholarship is awarded once every three years.

Honor Scholarships.—Two scholarships available each year to students entering upon full-time study. Each scholarship provides a cash award, in addition to tuition aid, in an amount depending on need, for all three years. These scholarships are awarded on the basis of outstanding college records, both academic and extracurricular; Law School Admission Test scores; and need. To retain the scholarship for the second and third years, the candidates must maintain a *B* average, both for each year and cumulative.

Law Center Tuition Remission.—For Juris Doctor students, based on financial need.

Phi Delta Delta Scholarships (1959).—Zeta Chapter of Phi Delta Delta Legal Fraternity (International), provides tuition aid to a student in the second year of the Juris Doctor program who excelled in scholastic achievement and service to the Center in the first year.

Vernon Romney Scholarship Fund (1977).—To provide a scholarship to some worthy student in the Law School.

Trustee Scholarships.— Scholarships awarded each year to entering full-time students, for tuition aid, in amounts depending on need. Candidates must have demonstrated qualities of leadership, in addition to scholastic attainment. To retain the scholarship, the successful candidate must maintain a *B* average, both for each year and cumulative. Application must be made to the Dean before March 1.

Tuition-aid scholarships are also available to continuing second- and third-year full-time students with demonstrated scholastic ability, on the basis of financial need and capacity for leadership. Application should be made to the Dean prior to June 1.

Frank S. Whitcomb Scholarship Fund (1971).—Bequest of Frank S. Whitcomb for the purpose of aiding and assisting worthy young men and women in securing a legal education.

Graduate Fellowship Information Center.—Students may also wish to visit the Graduate Fellowship Information Center (2025 H St., N.W.) for additional information on fellowships and grants.

Loan Funds

Through the generosity of friends of the University a number of loan funds are available. Among them are the Lyle T. Alverson Loan Fund; the Robert Ash Loan Fund; the George R. Beneman Loan Fund; the Morris and Gwendolyn Cafritz Foundation Minority Law Student Loan Fund; the Robert M. and Mary McConnel Cooper Loan Fund; the Robert McKinney Cooper Memorial Loan Fund; the J. Forrester Davison Loan Fund; the District of Columbia Bar Association Loan Fund; the J.W. Ehrlich Foundation Loan Fund; the Newell W. Ellison Loan Fund; the Harold L. and Violet George Foundation Loan Fund; the George Washington Law Association Loan Fund; the Morris Golub Loan Fund; the Jephson Educational Trust Loan Fund; the Law Association Loan Fund for the law classes of 1912, 1918, 1921, 1924, 1929, 1931, 1933, 1935, 1936, 1937, 1938, 1939, 1941, 1942, 1945, 1950, 1951, 1952, 1953, 1955, 1959, 1960, 1961, 1962, 1963, 1964, 1965; the Law School Loan Fund; the Oscar Lawler Memorial Loan Fund; the Horace L. Lohnes Memorial Assistance Fund; the Jessie B. Martin Loan Fund; the Robert N. Miller Loan Fund; the Joan Murphy Loan Fund; the Mike Pelekiri Fund; the Phi Delta Delta Loan Fund; the W. Theodore Pierson Loan Fund; the Rockport Loan Fund; the Samuel L. Samuel Loan Fund; the H. William Tanaka Law Students Assistance Loan Fund; the Orville Hassler Wallin Memorial Loan Fund; the W.H. Williams Memorial Student Loan Fund; the Ruth F. Wilson Loan Fund; and the Yadao and Kanemoto Loan Fund.

In addition, financial assistance is available through the Guaranteed Student Loan Program, National Direct Student Loans, and other sources.

Application for financial assistance should be made in the Office of the Dean.

MASTER'S AND DOCTORAL PROGRAMS

Fellowships and Scholarships

Application should be made before March 1 preceding the period for which the award is made. The applicant should submit an application for admission as a degree candidate and a personal letter applying for a fellowship to the Dean. The letter of application should contain complete biographical data, information as to experience in practice or teaching, and copies of or citations to published legal writings, and such other information the student believes will be of assistance in the consideration of the application. Applicants should arrange for letters of recommendation to be sent from two members of the law faculty directly to the Dean. The applicant's academic rank in class should be included either in the transcript of the law school or in the letters of recommendation.

Graduate Fellowship.—Sponsored by the Food and Drug Law Institute. A stipend of $10,000 will be available in 1979–80 to finance a fellowship in Food and Drug Law. The academic work under this Fellowship leads to receipt of a general, undesignated Masters degree or a designated Masters degree in Administrative Law: Economic Regulations or Patent and Trademark Law, on the satisfactory completion of 24 credit hours of approved work. A thesis of publishable quality will be a mandatory requirement for the degree, as well as a minimum two hours per semester of clinical work in food and drug practice in the Law Center's clinical program under the supervision of a faculty advisor.

Teaching Fellowships.—Three or four fellowships available each year with a stipend of $8,000 plus tuition for an approved course of study leading to an advanced degree. Teaching fellowships are awarded for a term of two academic years. Fellows conduct the first-year course in Legal Research and Writing and work with the students to improve their legal writing ability. By arrangement with the Dean, they may also be given the opportunity to teach additional courses.

Richard Paul Momsen Scholarships for Brazilian Graduate Law Students.—Bequest of Richard Paul Momsen, LL.B. 1912. Awarded 1978–79 and alternate years, for the study of U.S. constitutional law and the law of patents and trademarks.

Prizes

Jacob Burns Prize.—Established by Jacob Burns, a law alumnus and Trustee of the University. A medal and $100 awarded annually to each of the two members of the winning team in the upperclass Van Vleck Moot Court competition.

Ogden W. Fields Graduate Prize.—Fifty dollars awarded annually to the graduate student who has demonstrated the highest overall proficiency in a course in labor law.

Charles Glover Prize.—Established by Charles Carroll Glover, Jr., an Honorary Trustee of the University, in memory of his great-grandfather, an illustrious member of the bar of the District of Columbia. Consists of selected law books. Awarded annually to the student who has attained the highest average grade in the third-year, full-time course.

Kappa Beta Pi Prize.—Awarded by Eta Alumnae Chapter to the law student who attains the highest average for the first year.

John Bell Larner Prize.—By bequest, a medal awarded annually to the member of the graduating class who attains the highest average grade in the entire course for the degree of Juris Doctor.

John Ordronaux Prizes.—By bequest, $75 awarded annually to the student who has attained the highest average grade in the first-year, full-time course; and $75 to the student who has attained the highest cumulative average grade at the end of the second-year, full-time course.

United States Law Week Award.—Presented to an outstanding senior law student.

Jennie Hassler Walburn Prize.—A cash reward to the outstanding student in the field of civil procedure, established by the will of the late Professor Orville Hassler Walburn in memory of his mother.

Regulations

ACADEMIC WORK LOAD

Juris Doctor Candidates.—Juris Doctor candidates without substantial outside employment may take a program of studies of 14 hours a week. Such students may take courses in the evening only if they are not scheduled in the daytime and if a majority of the hours taken are in day courses. The Dean is authorized to approve programs of study of more than 14 hours in exceptional cases; however, no program will be approved which would permit the student to complete requirements for the degree in less than 28 months after beginning the first year of law study. Students with more than 15 hours of outside employment, whether in the day or evening division, must take a limited program of studies not exceeding 10 hours a week. Students taking a majority of their classes in the evening may not take more than 10 hours a week: the minimum load is 8 hours, except in special cases where 6 may be approved by the Dean for a limited time. A minimum schedule of 11 hours in the day division is required except in exceptional circumstances when a reduced program is authorized by the Dean.

Students taking more than 8 hours in the day division or 4 hours in the evening division must have the permission of the Dean to take a Bar Review course.

Students may transfer from the day division to the evening division only with the permission of the Dean.

With the approval of the Dean, second- and third-year students may take a maximum of 6 semester hours of appropriate courses in other departments of the University; such a student must receive a grade of at least *B* to obtain credit for such courses, and in no event will the grade count in computing the cumulative average.

Master's Candidates.—Master's candidates without substantial outside employment may take a maximum of 12 hours a week. Students with more than 15 hours of outside employment must take a limited program of study not to exceed 8 hours a week. The minimum load is 4 hours unless approval for fewer hours is given by the Dean for a limited time.

ATTENDANCE

Regular attendance at classes is required and is necessary for successful wo
A student who is deficient in class attendance in any course may be barre
from taking the examination.

CHANGES IN PROGRAM OF STUDIES

A student may not add courses or change from one section to another of th
same course without the approval of the Dean. Students may drop course
only with the written approval of the Dean. In addition, approval of the i
structor is ordinarily required unless the request is made early in the semester
Under no circumstances may any student drop a course after the last day o
classes in any semester or summer session.



RESEARCH PAPERS

The preparation of a research paper is required in lieu of an examination in seminars and in other courses, as indicated in the course descriptions. Any research paper must be submitted by the first day of the examination period (the first day any examination is given in any course). For sufficient reason, the instructor may extend the time beyond this date to a later date (but not later than the last day of classes of the following semester, or without express permission of the Dean, not later than the normal graduation date for the student), subject to the following conditions: (1) no student will receive any credit for the course for any purpose until a paper acceptable to the instructor has been submitted; (2) if a paper is submitted after the last day of examinations for the last Wednesday before registration for the spring semester), the only grade the student may receive for the course is *CR* (Credit) or *NC* (No Credit), except that failure ultimately to submit any paper for the course will result in a grade of 45. Students who are candidates for the J.D. degree may register for one course requiring a research paper in each semester of their third year; with the approval of the Dean such students may register for more than one such course each semester. Approval of the Dean is required for second-year students to take such courses.

EXAMINATIONS

Written examinations are held at the end of most courses. Every student is required to take the regular examinations unless excused. No excuse for absence will be granted except by the Dean and then only for illness or other emergency. Application for excuse must be made in writing not later than one month after the date of the examination. A student excused from a final examination will be permitted to apply to the instructor for a Credit/No Credit determination. The instructor will select the mode of determination (for example, a make-up examination or paper). The student will have the option of (1) complying (prior to the completion of the semester following the excused absence) with the instructor's procedure of determining Credit/No Credit, or (2) having the grade *I* (Incomplete) entered on the record and taking the next regularly scheduled examination for a numerical grade. The examination may not be taken after exclusion for low scholarship.

Permission to take an examination before the regularly scheduled date will not be granted. Permission to take a postponed examination is limited to the situations provided for in the preceding paragraph.

A student who has been excused from taking a regular examination and who is a candidate for a degree to be conferred prior to the next regular examination in the subject may petition the Scholarship Committee, which may authorize such action as the circumstances require.

If a student fails to take an examination, a grade of 45 will be recorded unless the student has been excused from the examination as provided above or has obtained the Dean's permission to drop the course.

CREDIT/NO CREDIT OPTION

Candidates for the degree of Juris Doctor may take, in addition to courses regularly given on a Credit/No Credit basis, 12 semester hours of elective course work on a Credit/No Credit basis, and will receive a grade of Credit

if the course is satisfactorily completed with a grade of 65 or better. No s
dent may change from a numerical grade to a Credit/No Credit basis in
course during the last four weeks of classes except with the permission of
instructor. An unexcused failure to take an examination in a course or fa
to submit a required research paper will result in the recording of a grade
45 for a course taken on a Credit/No Credit basis.

No student may take more than 17 semester hours of courses (including L
220 and other courses regularly given on a Credit No Credit basis) on
Credit/No Credit basis.

Students are advised to consider carefully the advisability of electing to
courses on a Credit/No Credit basis. In the opinion of the faculty, a st
dent's election to take courses on a Credit/No Credit basis may, in view
the importance apparently attached to grades by educational institutions a
employers, be detrimental to the student's career in the legal profession.

GRADES

Grades are given in numerical terms equivalent to letter grades as follows:
85–100, *A*, Excellent; 75–84, *B*, Good; 65–74, *C*, Satisfactory; 55–64, *D*, Poo
—below standard for graduation; 45–54, *F*, Failure. In Law courses 220, 32
22, 323, 342, 343, 345, 346, 385, 399, 459, 479, 509, 579, and 593 grades
CR, Credit (minimum grade of 65 required for J.D. candidates, 75
quired for LL.M. candidates); *NC*, No Credit. A student who has been
cused from taking a regularly scheduled examination is given the grade
Incomplete. See "Examinations" (page 40) for grade upon failure to take
examination. Grades between 55 and 100 indicate that the work has be
completed and credit given. Grades between 55 and 64, however, do not repr
sent satisfactory work and adversely affect a student's cumulative average. N
credit is given to J.D. candidates for grades below 55 or to post-J.D. cand
dates for grades below 65. No grade may be changed by an instructor after
has been posted in the law school or disclosed to a student unless there ha
been an error in arithmetic certified in writing as such by the instructor.

Any student who receives a grade below 55 (*F*) has the right to retake
course once, from the same or a different instructor, but only within the next
academic year. (This does not apply to post-J.D. students.) The grade re
ceived in the retaken course shall be entered into the student's record in
addition to the original grade, and both grades shall be included in computing
the student's average. A student may exercise the right to retake a course
only with respect to two different courses during study at the Law Center.

The cumulative average of a student includes all grades in all courses taken
while a candidate for a particular degree.

EXCLUSION AND PROBATION FOR POOR SCHOLARSHIP

Candidates for the Degree of Juris Doctor.—A student whose cumulative
average at the end of any semester falls below 65.0 but is above 64.0 will be
put on probation. If such a student fails to raise the cumulative average to
65.0 at the end of the next semester, the student will not be permitted to
register for any succeeding semester unless the student petitions for and re
ceives the permission of the Scholarship Committee.

A student whose cumulative average at the end of any semester falls below 64.0 will not be permitted to register for any succeeding semester unless the student petitions for and receives the permission of the Scholarship Committee to register.

A student who fails or receives a grade of No Credit in more than one course over the entire period of law study will not be permitted to register for any succeeding semester or to graduate unless the student petitions for and receives the permission of the Scholarship Committee.

A student who is not permitted to register under the foregoing provisions will be excluded as of the beginning of the semester for which the student was ineligible to register.

Students who are registered at the time they receive notice that they will not be permitted to register for the next semester are entitled to withdraw from school and to receive a full refund of the tuition paid for the semester, or to complete the work for which they are registered.

Any student excluded may petition for reinstatement; if the student can demonstrate that the low grades were due to circumstances beyond the student's control and that the student has the capacity to pursue the study of law with a definite likelihood of success, that student may be readmitted subject to such conditions as may be imposed by the Scholarship Committee.

Despite the above provisions, a student will be allowed to complete the first two semesters of law study before being denied permission to register for a succeeding semester.

For this purpose the term "semester" includes a session of the summer term.

Candidates for Masters' and Doctoral Degrees.—A candidate for a master's or doctoral degree whose work is not satisfactory in the opinion of the faculty, taking into consideration the requirements and standards for the degree, may, by action of the faculty, be excluded at the end of the semester for which the candidate is currently registered.

A cumulative average of 78 (see page 19) is required for the Master of Laws degree and a cumulative average of 65 (see page 25) for the Master of Comparative Law degrees. A student whose cumulative average falls below the required minimum at any time will be ineligible for continuation in the program without the permission of the Dean. Such a student will not be permitted to register for any succeeding semester unless the student petitions for and receives the permission of the Dean or the Board for Graduate Studies.

Unclassified Students.—An unclassified student whose work is not satisfactory may be excluded at the end of the semester for which the student is currently registered.

SUMMER SCHOOL CREDIT

Students planning to attend summer school sessions at other law schools and desiring to use credits obtained at such schools in their Juris Doctor program at this Center must first have the courses they wish to take approved by the Dean. Students may not take courses in summer sessions at other law schools in this vicinity if these same courses are being given during the Summer Session at the National Law Center. In no event will credit be given for unsatisfactory work or be recognized in excess of that which might be obtained in a similar period in this program. Students who register at another law school must provide the Dean with an official transcript of their work there promptly upon its completion.

TRANSCRIPTS OF RECORD

Official transcripts of student records will be issued on request of the stud or former student who has a clear financial record. A fee of $2 is charg for each transcript. When more than two transcripts are ordered at the s time, a $2 fee is charged for each of the first two transcripts and a $.5 is charged for each additional transcript.

CONTINUOUS ENROLLMENT

Degree candidates are expected to maintain continuous enrollment until degree requirements are satisfied. By failing to register for one semester more, the student breaks registration and must be readmitted (see "Re mission," page 29). A readmitted student is required to satisfy the curric lum requirements existing at the time of readmission.

GRADUATION REQUIREMENTS

Diplomas are awarded in February, May, and September.

To be recommended by the Faculty for graduation, a student must have m the admission requirements of the National Law Center; completed satisfac torily the scholarship, curriculum, residence, and other requirements for t degree for which the student is registered; and be free from all indebtedness the University. Registration is required for the semester or summer session the close of which the degree is to be conferred.

Application for Graduation.—An "Application for Graduation" form must be filed and the appropriate fee paid at the time of registration for the las semester or summer session of the final year. Students completing degree re quirements during the Summer Sessions will be awarded diplomas (no formal convocation) September 30, *provided* they have completed all degree require ments and have applied for graduation as a part of registration for the Summer Sessions. If they wish, such students may participate in the Winter Convocation.

ACADEMIC DISHONESTY

The University community, to fulfill its purposes, must establish and maintain guidelines of academic behavior. All members of the community are expected to exhibit honesty and competence in their academic work. Incoming students have a special responsibility to acquaint themselves with, and make use of, all proper procedures for doing research, writing papers, and taking examina tions.

Members of the community will be presumed to be familiar with the proper academic procedures and held responsible for applying them. Deliberate failure to act in accordance with such procedures will be considered academic dishonesty. Acts of academic dishonesty are a legal, moral, and intellectual offense against the community and will be prosecuted through the proper Uni versity channels.

Copies of the University policy on academic dishonesty can be obtained from the following offices: all department chairmen, all academic deans, and the Vice President for Academic Affairs.

UNIVERSITY POLICY ON THE RELEASE OF STUDENT INFORMATION

The Family Educational Rights and Privacy Act of 1974 applies to institutional policies governing access to and release of student education records maintained by educational institutions which are recipients of federal funds. The University complies with this statute, which states, in part, that such institutions must:

1. afford students access to education records directly related to them;
2. offer students an opportunity for a hearing to challenge such records as inaccurate, misleading, or otherwise inappropriate;
3. receive the student's written consent before releasing information from his or her education records to persons outside the University, except for directory information as indicated below. Information may be furnished to a student's parents without such written consent only upon certification of the student's financial dependency; and
4. comply with a judicial order or lawfully issued subpoena to release a student's record, notifying the student of this action.

The University will release the following directory information upon request: name, local address, and telephone number; name and address of next of kin; dates of attendance; school, college, or division of enrollment; field of study; credit hours earned; degrees earned; honors received; participation in organizations and activities chartered or otherwise established by the University (including intercollegiate athletics); and height and weight of members of athletic teams. A student who does not wish such directory information released must file written notice to this effect in the Office of the Registrar.

Copies of the University's full policy statement on the release of student information may be obtained from the Office of the Registrar.

RIGHT TO CHANGE RULES

The University and its various colleges, schools, and divisions reserve the right to modify or change requirements, rules, and fees. Such regulations shall go into force whenever the proper authorities may determine.

RIGHT TO DISMISS STUDENTS

If a student knowingly makes a false statement or conceals material information on an application for admission, registration card, or any other University document, the student's registration may be canceled and the student will be ineligible (except by special action of the Faculty) for subsequent registration.

The right is reserved by the University to dismiss or exclude any student from the University or from any class or classes, whenever, in the interest of the student or the University, the University Administration deems it advisable.

RIGHT TO MAKE CHANGES IN PROGRAMS

The right is reserved by the University to make changes in programs without notice whenever circumstances warrant such changes.

PROPERTY RESPONSIBILITY

The University is not responsible for the loss of personal property. A "Lo and Found" Office is maintained on campus in the Safety and Security Offic

STUDENT CONDUCT

All students upon enrolling and while attending The George Washington Un versity are subject to the provisions of the *Statement of Student Rights* an *Responsibilities* which outlines student freedoms and responsibilities of conduc the Judicial System for Non-Academic Student Discipline, and other polic and regulations as adopted and promulgated by appropriate University author ties. Copies of these documents may be obtained at the Office of the Vice Pre dent for Student Affairs. Sanctions for violation of these regulations may clude permanent expulsion from the University, which may make enrollment another college or university difficult. Regulations or requirements applica only to a particular program, facility, or class of students may not be publishe generally, but such regulations or requirements shall be published in a manne reasonably calculated to inform affected students.

UNIVERSITY POLICY ON DRUGS

The University cannot condone violations of law, including violation of the laws which proscribe possession, use, sale, or distribution of drugs. Members of the academic community should know that administrative action, which may include dismissal from the residence halls, revocation of other privileges, or sus pension or dismissal from the University, may be taken in order to protect the interests of the University and the rights of others.

Center for Academic and Administrative Computing

Director F. William Rambo

THE CENTER FOR ACADEMIC AND ADMINISTRATIVE COMPUTING is located on the third floor of Lisner Hall, 2023 G St., N.W. The computer and other opera tional supportive services are located on the first floor of Stuart Hall, 2013 G St., N.W. These facilities normally are available 24 hours a day, seven days a week to all qualified faculty, staff, and students.

The Center provides computational facilities, conducts seminars, consults with users, and provides operational assistance as required. The Center oper ates an IBM 370/148 (OS/VS1) central processing unit and a PDP 11 computer which provides terminal and card remote-job-entry (RJE) to the 370/148 for students. There is a full range of compilers and application soft ware packages.

Computer programming courses are offered by the School of Governmen and Business Administration, the Department of Statistics, and the School of Engineering and Applied Science. In addition, many other departments offer courses that utilize the computer as a research adjunct to course work.

Student Services

RESIDENCE HALLS

The University does not provide regular residence hall space for graduate students. However, the Housing Office refers graduate students to apartments as they become available in three University-owned buildings which are in the campus area. Additionally, the Housing Office operates an Off-Campus Housing Resource Center, and attempts to provide information and assistance for those seeking accommodations. For complete information on this service, as well as apartment guides and referrals, interested applicants should contact Director of Housing, George Washington University, Washington, D.C. 20052.

FOOD SERVICE

Contract food service is available from August to May, and is based on the undergraduate academic calendar of registration, exams, and vacation periods. Accommodations for the law school calendar are made. The rate for the seven-day, 19 meals per week plan has been set at $1,062. The any 14 meals per week plan costs $994; the any 10 meals per week plan, $946. Contract service is cafeteria style and provided in two residence halls and the Cloyd Heck Marvin Center. Meal coupons may also be used on a cash equivalency basis in the Marvin Center first floor a la carte cafeteria and in the Rathskeller.

CLOYD HECK MARVIN CENTER

The Cloyd Heck Marvin Center serves as the campus community center, providing services, conveniences, and recreational and social opportunities for students, faculty, staff, alumni, and guests. Its wide range of facilities provides the setting for a variety of programs conducted by the University Program Board, the departments offering course work in the performing arts, and other student and faculty organizations.

The Center Governing Board, representing varied segments of the University community, plays an important role in the day-to-day functioning of the Center. This Board works closely with the full-time staff in the development of procedures and policies which provide a framework for the Center's operation.

STUDENT HEALTH SERVICE

The Student Health Service is an outpatient clinic located in the H.B. Burns Memorial Building at 935 22nd St., N.W.

Physicians and physician assistants are available by appointment from 9 a.m. to 4:45 p.m., Monday through Friday. In addition, physician assistants are available for primary care to walk-in patients Monday through Friday from 5 to 6:45 p.m., on Saturday from 9 a.m. to noon, and on Sunday from 10 a.m. to noon.

For serious emergencies occurring during hours when the Student Health Service is closed, students may go to the Emergency Room of the University Hospital for treatment. This arrangement is for emergency care only, and all fees are the responsibility of the student.

Students must be currently enrolled on campus in the University to receive treatment at the Student Health Service. Students who so desire may employ physicians and nurses of their own choice, but these students will be responsible for all fees charged. The bills incurred from all services rendered outside of the Student Health Service (for example, x-ray work, laboratory work, and referrals to specialists or other outside physicians) are the responsibility of the student.

Health and Accident Insurance

The Student Health Service Office has arranged for and endorsed group health and accident insurance, on an elective basis, for those *full-time* students who do not have other coverage. Interested students should contact the Student Health Service Office.

STUDENT EMPLOYMENT

A student taking more than 10 semester hours must limit outside employment to less than 16 hours (see "Academic Work Load," page 37). It is urged that full-time students refrain from engaging in outside employment during their first year. Although work in some special areas may contribute to the learning and experience of the student, as a general rule it will conflict with time needed for adequate study and preparation, which are at the heart of a good legal education.

PLACEMENT SERVICE

The Law Center takes a continuing interest in the placement of its students and alumni. The Dean, the Faculty, and the Placement Office cooperate in providing information from alumni, law firms, government agencies, and other sources concerning job openings for our seniors and alumni throughout the country. Other services include part-time and full-time law clerk listings, summer positions, programs on job-seeking skills, a library of available literature on law placement, counseling on various opportunities, resume preparation guidance, arrangement of on-campus interviewing programs, and the administration of the judicial clerkship evaluation program.

Of the 1978 graduates, 290 graduates informed the Placement Office of their positions. There was considerable variety in the types of positions obtained, with 122 in private law firms; 73 with the federal government, nine with state and local government agencies; 27 with business concerns; 27 as judicial clerks; five with legal services for the indigent; seven with public interest organizations; three with accounting firms; one with a bank; seven in legal military positions; five with academic communities; and four with trade associations. These positions were located in 32 states and the District of Columbia.

VETERANS BENEFITS

The veterans counselor, located on the fifth floor of Rice Hall, 2121 Eye Street, N.W., assists students entitled to educational benefits as veterans or as widows or children of deceased or totally disabled veterans with any problems which may arise concerning their benefits. This Office also processes certification of



enrollment and attendance to the Veterans Administration so that monthly allowances will be paid.

When feasible, students entitled to benefits as veterans or dependents of veterans should consult with the veterans counselor prior to submitting application to the Veterans Administration. All such students should obtain the instruction sheet issued by the Office of the Registrar, which sets forth requirements to be fulfilled before certification of enrollment can be made to the Veterans Administration, and which includes other information of general interest.

The Veterans Administration is at 941 N. Capitol St., N.E., Washington, D.C. 20421.

OFFICE OF SERVICES FOR STUDENTS WITH DISABILITIES

The Director of the Office of Services for Students with Disabilities coordinates advising, orientation, and special services which address the needs of disabled students. The Director also serves as a central point of contact from which the University community may obtain information and assistance in serving disabled students. A resource library maintained in the Services Office is available for general use.

In addition to coordinating a program of general assistance to promote integration of disabled students as fully as possible into the life of the University community, the Director administers reading and sign language services for those with visual and auditory handicaps.

The Office of Services for Students with Disabilities is located on the fourth floor of Rice Hall, 2121 Eye Street, N.W.

COURSES OF INSTRUCTION

THE COURSES OF INSTRUCTION listed below are subject to change. The Univer sity reserves the right to withdraw any course announced.

The number of hours of credit given for the satisfactory completion of course is indicated in parentheses after the name of the course. Thus, a ye course giving two hours of credit each semester is marked (2-2), and a semes ter course giving two hours of credit is marked (2).

In most courses, a final examination is held during the examination perio and the grade in the course is determined in large part by that examinatio These courses are parenthetically marked "Examination."

Courses that require the preparation of a major research paper in lieu of examination are parenthetically marked "Research Paper." The satisfactor completion of such a paper by a student individually will satisfy the Leg Writing curriculum requirement for the J.D. degree.

Courses parenthetically marked "Problem Assignments," "Writing Assig ments," "Take-home Examination," "Choice of Paper or Examination," "Clinical Work" indicate the nature of the method planned by the instructo for determining in major part the grade to be given for the course. A course marked with any of these designations will not satisfy the Legal Writing curr ulum requirement for the J.D. degree.

Day classes begin at 9:10 a.m. and run throughout the entire morning an afternoon. Evening classes begin at 5:50 p.m. Many examinations for both day and evening classes may be given in the afternoon only. Examinations for day students may be held in the evening.

A parenthetical designation at the end of a course description indicates whether the course is scheduled to be offered in the spring or fall semester or in the summer sessions, and also usually whether it will meet in the day or evening. When a double numbered course is designated "Academic year," the first half of the course is scheduled to be offered in the fall, the second half in the spring. Courses with no parenthetical designation indicating time of offering are not scheduled to be given during the 1979 summer sessions or the 1979–80 academic year.

Courses for Juris Doctor Candidates

Required courses are numbered from 201 to 300. Courses numbered from 301 to 400 are normally taken by second- and third-year students. Courses numbered from 401 to 600 are generally more advanced. Second-year students may take courses numbered above 400 only with the permission of the Dean. Third-year students are encouraged to take one course numbered above 400 each semester, and may take more than one such course with the permission of the Dean.

The following courses are among those offering clinical work: Law 343, 345, 346, 396, 399, 459, 479, 513, 516, 579.

REQUIRED COURSES

203–4 **Contracts I–II** (4–2) Nash, Cibinic, Pock, Ginsburg, Caplan

Legal remedies of contracting parties, including damages in contract and quasi-contract, specific performance, reformation, rescission, remedies in tort; acts creating and terminating contractual rights, including offer and acceptance, mistake, problems of proof; function of consideration; conditions; assignments; third-party beneficiaries; effect of changed circumstances; protection of the client's interests upon breach or threat of breach by the other party. Emphasis on problems of analysis, draftsmanship, adversary method. (Examination) (Academic year—day and evening)

207 **Torts** (4) Seidelson, Banzhaf, Schwartz, Sirulnik, Reitze, Dienes

Liability for harm to person or property. Intentional torts, negligence, nuisance, products liability, misrepresentation, defamation, and invasion of privacy; fault and other basis for shifting losses, causation; damages; effects of liability insurance; problems under Federal Tort Claims Act. **(Examination) (Fall—day and evening)**

211 **Property** (4) Starrs, Schiller, Brown, Chandler

Basic concepts of personal property. Real property: historical background of the law of estates and conveyancing, types of estates, dower and curtesy, landlord and tenant relationship, concurrent estates, future interests at common law and after the Statute of Uses; introduction to modern conveyancing—the real estate contract, the deed, the recording system, methods of title assurance. (Examination) (Fall—evening; **spring—day; summer 1979)**

212 **Constitutional Law** (4) Mayo, Barron, Park, Cheh, Dienes

Basic principles of American constitutionalism; judicial function in constitutional cases; implementation of doctrines of separation of powers, federalism, limited government; development and exercise of national powers; introduction to civil rights and liberties. (Examination) **(Spring—day and evening; summer 1979)**

215 **Criminal Law and Procedure** (4) Starrs, Robinson, Zenoff, Sirulnik, Caplan

Origin and purposes of criminal law; elements of criminal liability; mental disorders; crimes against the person, property, and against both; statutory offenses; criminal procedure, with consideration of Federal Rules of Criminal Procedure. (Examination) (Fall—day; spring—evening)

218 **Civil Procedure** (4) Sharpe, Schwartz, Kayton, Stevenson, Cheh, Ross, Fink

Mechanics of litigation—rules which govern the process by which rights and duties studied in substantive law courses are enforced; pleadings, discovery, pre- and post-trial motions, jurisdiction and venue, equity jurisdiction and trial by jury, former adjudication. Emphasis on Federal Rules of Civil Procedure, but principles and main problems indigenous to all procedural systems are developed. (Examination) (Spring—day and evening)

220 **Legal Research, Writing, and Professional Responsibility and Ethics** (2) Seidelson and Staff

Introduction to and practical experience in the use of a law library; instruction and practice in legal writing, including a memorandum and

appellate court brief; instruction and experience in the preparation ... argument of an appellate court case; instruction in questions of p... sional responsibility and ethics. The grade *CR* (Credit) or *NC* ... Credit) is given for this course. For credit, a student must attain a m... mum grade of 65. Failure to complete the work in this course will res... in a grade of 45. (Fall—day and evening)

232 **Evidence** (4) Seidelson, Robinson, Albert, Pan...

Preparation and presentation of evidence, including proof of wri... qualification and examination of witnesses with emphasis on impeach... privilege; opinion testimony; determination of relevancy; demons... experimental, scientific evidence; application of the hearsay rule ... nation) (Spring—day and evening; summer 1979)

ELECTIVE COURSES

302 **Admiralty** (2) Sharp...

American practice and jurisdiction in admiralty; saving clause actions ... law. Substantive maritime law of title and possession, maritime liens ... personal injury and wrongful death, charter parties and bills of lading ... general average and salvage and marine insurance, collisions. Law... methods: judge-made law, statutes, international commercial custom, an... treaties. (Examination) (Spring—day)

303 **International Law and World Order** (3) Mallis...

An introduction to international law which provides the backg... for the study of specialized seminars; emphasis on national states ... participants in decision-making processes with consideration also of ... dividuals; analysis of range of available sanctions; roles and effe... international agreements under United States Constitution; introduc... study of the World Bank. Complements but does not repeat mate... Law 304. (Examination) (Fall—day and evening; summer 197...

304 **United Nations Law and World Order** (2) Ma...

Introduction to international law through study of law and practi... United Nations Charter; structure and process of decision of United Na... tions; maintenance of international peace and security—peaceful settl... ment of disputes and national and collective self-defense; including c... rent problems considered by the United Nations. Complements but, exc... not repeat the material in Law 303. (Examination) (Spring—day, ... evening)

307 **Comparative Law** (3) Delaume...

A general introduction to the world's main legal systems with emphasis ... on civil law. Comparative study of the administration of justice, pro... cedural problems, and selected substantive legal institutions. (Exam... nation) (Spring—day)

309 **Conflicts of Laws** (3) Seidelson, Pock, Lowther...

Legal problems arising from occurrences transcending state or nation... boundaries; jurisdiction; foreign judgments; constitutional influences; the... oretical bases of choice of law principles and their application to specific ... fields, including torts, contracts, property, family law, administration of ... estates, business associations. The grade *CR* (Credit) or *NC* (No C... only is given in sections taught by Lowther. Lowther—(Problem Assig... ments); Seidelson, Pock—(Examination) (Fall—evening; spring—...

311 **Agency and Partnerships** (2) Sharpe, Schiller

Employment relations, vicarious liability of employers for employees' torts, scope of employment, and independent contractors; agents' authority and apparent authority to contract for their principals, ratification; non-profit associations; the formation, operation, and termination of partnerships, limited partnerships. (Examination) (Fall—day and evening; summer 1979)

312 **Corporations** (4) Stevenson, Solomon, Park, Cheh

Corporate law, with emphasis on operations and financing of corporations. Control of corporations, action by corporate directors, officers, shareholders. Control devices. Directors' and shareholders' duties of care and loyalty, insiders' transactions in shares of the corporation. Derivative suits, kinds of shares, dividends, corporate distributions. (Examination) (Fall—day and evening; summer 1979)

313 **Sales and Sales Financing** (2) Albert, Rothschild, Ginsburg, O'Dea

Provisions of the Uniform Commercial Code relating to sale and distribution of goods, including bulk transfers, warehouse receipts, bills of lading, and other documents of title; particular attention to secured transactions and financing devices utilized in this connection. (Examination) (Fall—day and evening)

314 **Commercial Paper, Check Collection, and Banking** (2) Albert, Rothschild, Ginsburg, O'Dea

Classic view of negotiable instruments as codified by Article III of the Uniform Commercial Code. Check collection, the system in theory as expressed in Article IV of the Uniform Commercial Code and the system in practice; Federal Reserve regulations, Clearing House agreements, and automation systems. The dual banking system, work of the Comptroller General and the Federal Reserve Board. Legal problems concerning interest and the checkless society. (Examination) (Spring—day and evening)

318 **Creditors' Rights** (3) O'Dea

Creditors' remedies outside bankruptcy—compositions, agreements, general assignments; bankruptcy proceedings under the federal statute, administration, discharge, the position and powers of the trustee, preferences; corporate reorganization under Chapter X of the Bankruptcy Act. (Examination) (Fall—day; spring—evening; summer 1979)

321–22 **Current Decisions** (2–2)

Limited to members of the student staff of the *Law Review*. A maximum of 4 semester hours of credit may be earned in this course. The grade *CR* (Credit) or *NC* (No Credit) is given for this course. (Academic year—day and evening)

323 **Journal of International Law** (1 to 4)

Limited to editors of the student staff of the *Journal of International Law and Economics*. The grade *CR* (Credit) or *NC* (No Credit) is given for this course. (Fall and spring—as arranged)

325–26 **Trusts and Estates I–II** (3–3) Weaver, Chandler, Solomon

Noncommercial transfers of wealth at death or during life. Law 325: essential elements and formalities for creation of trusts and execution of wills, revocation and alteration, grounds for contest, limits on property owner's power to control, intestate succession. Law 326: dispositive provisions, common questions of construction, future interests problems,

administration of estates and trusts, charitable trusts. Prerequisite to Law 325: Law 211; to Law 326: Law 325. (Examination and Problem assignments) (Law 325: fall—day and evening; spring—day; Law 326: spring—day and evening)

327 **Modern Real Estate Transactions** (2) Brown, Schill

Advanced problems in purchase and sale of real estate: legal responsibilities and functions of buyer, seller, broker, escrow agent, conveyancing attorney, title examiner, abstractor, insuror of title; process of examination and assurance of title and other interests in realty, including recording, registration and title insurance systems, settlements and closings, warranties, hazard insurance; emerging problems related to cooperatives, condominiums and property-owners' associations; problems related to compliance with subdivision, zoning, building and housing code regulations. (Examination) (Spring—day)

329 **Unfair Trade Practices** (3) Weston, Banzhaf, Schwartz

Unfair trade practices at common law and under statutes: trademarks, trade names; copyright law; misappropriation of ideas; protection of competitors and consumers against false advertising under Federal Trade Commission Act; resale price maintenance under state Fair Trade Acts, state sales-below-cost statutes; Robinson-Patman Price Discrimination Act, miscellaneous business practices. (Examination) (Fall—day and evening)

330 **Federal Antitrust Laws** (3) Weston

Sherman and Clayton Acts, related statutes. Price-fixing agreements and other types of trade restraints considered under Section 1; monopolies considered under Section 2 of the Sherman Act. Mergers and tie-in sales, other activities under the Clayton Act. All types of business conduct raising questions under the antitrust laws, including trade association activities, exclusive-dealing arrangements, boycotts, patents and copyrights. (Examination) (Spring—day and evening)

331 **Product Liability** (2) Schwartz

Development of the concept of product liability and consumer's remedies. Specific problems and processes in evaluation of risk and benefit encountered in government regulation of dangerous and defective products. Survey of civil actions for harm resulting from defective and dangerous products with reference to parties and proof in negligence, warranty, nuisance, fraud, misrepresentation, and other cases. Problems associated with hazard identification, insurance, and industry self-regulation. Review of Consumer Product Safety Act and current legislation dealing with injuries and remedies in specific areas. (Choice of Research Paper or Examination) (Spring—day)

332 **Federal Jurisdiction** (2) Albert, Lowther, Barron, Kayton, Funk

Relationship of federal courts to Congress and to the states, through analysis of cases dealing with federal judicial functions (including problems of advisory opinions, standing to litigate, justiciability), federal questions in federal courts, federal review of state court decisions (including relation between state and federal substantive law, procedure), problems in exercising review, application of law to fact). The [illegible] *CR* (Credit) or *NC* (No Credit) only is given in sections taught by [illegible] ther. Albert—(Examination); Lowther—(Problem Assignments) —day and evening; spring—day)

334 **Advanced Criminal Procedure** (2) Starrs, Robinson, Zenoff

Decision to arrest, prosecutive discretion, bail, the preliminary hearing, right to a speedy trial, discovery, plea bargaining, publicity, post-conviction procedures. Starrs—(Examination and Problem Assignments), Robinson, Zenoff—(Examination) (Fall—day and evening)

335 **Jurisprudence** (2) Mayo, Park

Basic jurisprudential concepts; nature of law; development of legal institutions; jurisprudential schools—natural law, analytical, historical, sociological, functional; law and logic; law and justice; the judicial process; legislative, executive, administrative decision-making; impact of politics, economics, and scientific advance on legal systems; contemporary trends in jurisprudential thought. (Examination) (Fall—evening; spring—day; summer 1979)

336 **Taxation—Federal Income** (3) Weaver, Hambrick, Solomon, Kempler

Survey of substantive provisions of federal income tax law, including concept of gross income, provisions affecting taxation of family and individual transactions, limitations on allowable deductions, sales and dispositions of property, problems of capital gains taxation, nontaxable exchanges. Weaver—(Examination and Problem Assignments); Hambrick—(Examination) (Fall—day; spring—day and evening; summer 1979)

338 **Taxation—Federal Estate and Gift** (2) Hambrick, Weaver

Survey of substantive provisions of federal estate and gift tax laws, including inter vivos transfers, transfers in contemplation of death, joint interests, life insurance proceeds, property subject to powers of appointment, marital deduction and split gifts; tax procedure. (Examination) (Fall—day; spring—evening; summer 1979)

339 **Collective Bargaining and Labor Arbitration** (3) Merrifield, Rothschild

Collective labor agreement: content, negotiation, administration through grievance procedure and arbitration; problems in settlement of labor disputes. Prerequisite: Law 341. Merrifield—(Examination and Problem Assignments); Rothschild—(Problem Assignments) (Spring—day and evening)

340 **Taxation—Federal Income, Corporations and Shareholders** (3) Hambrick, Solomon, Kempler

Continuation of Law 336. Primary emphasis on corporate-shareholder relationships. Problems of corporate dividends, redemptions of stock, distributions in partial and complete liquidation, stock dividends, bail-outs, and dividends in kind closely analyzed. Federal income tax problems involved in the formation of corporations, the sale of corporate businesses (including collapsible corporations), mergers and acquisitions, and corporate divisions. Students who have received credit for former Law 337 cannot receive credit for Law 340. Prerequisite: Law 336. (Examination) (Fall—evening; spring—day)

341 **Labor Law** (3) Merrifield, Albert, Rothschild

Law governing labor-management relations, organizations and representation of employees, regulation of economic weapons, enforcement of collective bargaining agreements, interunion and intra-union relations. (Examination) (Fall—day and evening)

342 **Moot Court** (1 or 2)

Satisfactory participation in the upperclass competition results in one hour of academic credit. Finalists in the upperclass competition receive two hours of academic credit. Finalists in the first-year competition receive one hour of academic credit. No academic credit is awarded nonfinalists in the first-year competition. The grade *CR* (Credit) or *NC* (No Credit) is given for this course. **(Fall and spring)**

343 **Law Students Civil Rights Research Council (LSCRRC)** (1 or 2) Sirulnik

Clinical problems concerned with the legal problems of minorities, women, and the poor. Students work with organizations such as the Lawyers Committee for Civil Rights Under Law, Women's Legal Defense Fund, Civil Rights Division of the Justice Department, Institute for the Development of Indian Law, National Committee Against Discrimination in Housing, and National Senior Citizens Law Center. Approximately 60 hours of work per semester is required for each credit hour. The grade *CR* (Credit) or *NC* (No Credit) is given for this course. (Fall, spring, summer—as arranged)

344 **Legal Writing** (1 or 2) Staff

Preparation of a research paper under the supervision of a full-time member of the Faculty who will determine, prior to registration, whether the work required for the topic selected justifies one or two semester hours of credit. If elected for one hour of credit, this course may be repeated to meet the legal writing requirement for the degree. Approval of the faculty member is required prior to registration. (Research Paper) **(Fall and spring—as arranged; summer 1979)**

345 **Students-in-Court** (4) Stevenson

Open only to third-year law students. In the D.C. Law Students in Court Program, students represent indigent litigents in the Small Claims, Landlord-Tenant, and Criminal (misdemeanors) division of the D.C. Superior Court. Their duties include client interviews, investigation, settlement negotiations, preparation and argument of motions, and conduct of trials. Students are required to spend one day in court and attend seminars each week (Wednesday or Thursday evening at the student's option in the civil program; Monday evening and Saturday morning in the criminal program). Some seminars will be held off campus. Application must be made during the spring semester of the preceding academic year; preference will be given to students with a cumulative-grade average above 2.5; however, consideration is given to past participation in clinical or extracurricular activities or employment which provides background for participation and working with indigents. Students may participate during the summer, during the full academic year, or during the summer plus one other semester. This course may not be taken at the same time as Law 346 or any litigating activities in Law 346. The grade *CR* (Credit) or *NC* (No Credit) is given for this course. **(Fall and spring—as arranged; summer 1979)**

346 **Legal Aid** (arr.) Staff

Work done in connection with the Legal Aid Bureau under the supervision of the faculty adviser, who will determine, prior to registration, the number of semester hours of credit the work required will justify.

whether the student has all prerequisites. Any litigating activities of this course may not be taken at the same time as Law 345, or 579. The grade *CR* (Credit) or *NC* (No Credit) is given for this course. (Fall and spring—as arranged; summer 1979)

347 Insurance (2) **Schiller, Pock**

A primary risk-distributing medium and the rules by which legislative, administrative, and judicial bodies seek to promote its benefits and avert its dangers. Includes insurance marketing, insurable interest, subrogation, transfer of insurance benefits to nonpolicyholders, coverage and other insurance policy provisions, disposition of claims. (Examination) (Fall—day and evening; summer 1979)

348 Domestic Relations (2) **Potts, Zenoff**

Marriage, annulment, and divorce; adoption and custody of children; economic relations. (Examination) (Fall—evening; spring—day)

351 Law and Accounting (2) **Cibinic, Ginsburg, Fisher**

Study of fundamental accounting principles with emphasis on corporation accounting; legal and accounting implications of specific items in financial statements of corporations; inventory adjustments; corporate transactions, distributions, capital adjustments. Strongly recommended for students who have had no accounting. (Examination and Problem Assignments) (Fall—evening; spring—day)

355 Government Contracts (3) **Nash, Cibinic**

Survey of basic law underlying government procurement, basic power and limitations on federal government in entering into contracts, administrative and legislative policies governing these contracts, advertised and negotiated procurement procedures, forms of contracts and clauses used. Law 431 *Government Procurement Law* is the substantial equivalent of this course. (Examination and Problem Assignments) (Spring—day)

359 Patent Law (3) **Kayton, Schwaab**

Law of patents subsequent to issuance of patent; nature of patent as property and as a legal instrument; validity—novelty, nonobviousness, commercial success; infringement—direct and contributory, doctrine of equivalents and file-wrapper estoppel. Substantive concepts introduced in an order approximating patentee's and infringer's cases in litigation. Designed for students intending to specialize in patent law; knowledge or experience in patent law helpful but not prerequisite. (Examination) (Fall—evening)

362 Patent Office Practice (2) **Kayton, Henon**

Substantive and procedural law of patents leading to issuance of patent, mainly related to proceedings before U.S. Patent Office. Obtaining and preserving earliest possible patent filing date; continuing applications, res judicata, novelty and nonobviousness requirements; substantive rules of priority of invention and related affidavit practice; nature of claims and formal defects; restriction and double patenting. Designed for students intending to specialize in patent law. Prerequisite: Law 359. (Examination) (Spring—evening)

372 Administrative Law (3) Park, Banzhaf, Ba... Schwartz, ...

Study of the administrative process in executive and independent reg... tory agencies; emphasis on judicial review. Formal and informal deci... making, investigation, planning, and public administration functions... the agencies as related to their legal limits and to the roles of lawyers... government and private practice. Relationships of agencies to the exe... tive and legislative branches, to public and private interest groups, an... the social, political, and economic aspects of various philosophies... government regulation. Park and Banzhaf—(Examination) (Fa... day; spring—evening; summer 1979)

375 Remedies (3) Cibinic, Ginsburg, Nash, Lowth...

Development and use of judicial remedies that give relief for pas... threatened injuries to interests of personalty and property. Remedial ap... proaches include compensatory and punitive damages, injunctions, ... enrichment, constructive trusts, equitable liens, tracing, subrogation, ... specific reparation. Emphasis on comparing remedial options in fi... mistake, duress, breach of contract, and abuse of fiduciary relations... The grade *CR* (Credit) or *NC* (No Credit) only is given in sections ta... by Lowther. Cibinic, Ginsburg—(Examination); Lowther—(Problem; A... signments) **(Spring—day and evening)**



377 **Legislation** (2) Zenoff

Legislative process and roles of participants in the process; operation of United States Congress and state legislatures, including fact finding, organization, procedure. Statutory interpretations emphasized to provide foundation for more advanced courses. (Examination)

385 **Trial Practice Court** (2) Jackson, Ryan, Kendrick, McMullin, Skinker, Stevas, Altshuler, Nunzio, Seidel

Trial of assigned cases, trial techniques, pre-trial and courtroom procedures pursuant to federal rules. Students may repeat this course once for credit. Prerequisite: forty-two semester hours, including Law 218. Prerequisite or concurrent registration: Law 232. The grade *CR* (Credit) or *NC* (No Credit) is given for this course. (Fall and spring—day and evening)

389 **Medicine for Lawyers** (2) Hirsh

Survey of the basic medical sciences and the rudiments of clinical medicine as encountered in the practice of law. Medical terminology, the disease process, trauma, and industrial medicine. The application of this fundamental information is demonstrated in personal injury or negligence and malpractice litigation as well as in commitment and equitable proceedings. Students may witness autopsies at the D.C. Medical Examiner's Office, surgery at George Washington University Hospital, and medical rounds at D.C. General Hospital. Emphasis on enabling the lawyer to communicate most effectively with medical specialists. (Examination) (Fall and spring—day)

390 **Law and Medicine** (2) Sharpe, Fiscina, Head

Malpractice, insurance, and alternatives to professional liability litigation; securing and presenting medical evidence to prove causation and damages; chemical test data and behavioral science findings in court; entry into and practice of the professions; professional organizations; hospitals; professional service delivery; public policy intervention in medical science—for example, abortion, transplantation, and coerced treatment. (Examination) (Fall—day and evening)

394 **Women and the Law** (2) Ross

An examination of the treatment of women in all areas of the law and of legal remedies for sex discrimination. Emphasis on constitutional law, criminal law, discrimination in the media, education, and employment. Students choose clinical projects or research papers on which to focus the semester's work. Enrollment limited to 30 students. (Research Paper) (Spring—day)

396 **Legal Activism** (2 or 3) Banzhaf

Study of the use of law and the legal process, not as a technique for resolving disputes between identified individuals and/or organizations, but as a powerful tool for ameliorating problems of general public interest. Principles and techniques of legal activism, maximum effectiveness of public interest actions, how these actions differ from conventional legal practice. To learn these techniques effectively, and to test and develop their proficiency in their use, students will form clinical project groups and initiate or participate in a legal or law-related activity directed against a public interest problem of their own choosing. (Fall—day)

398 **National Center for Law and the Deaf Clinical Education Activities** (1, 2, or 3) Banzha

Work with the National Center for Law and the Deaf/Hearing Im paired in bringing legal information, services, and representation to more than 13 million Americans who are deaf or hearing impa The Center, a joint program of the National Law Center and the G laudet College, is designed to help make the hearing impaired aware their legal rights and to assist them in solving their legal and law lated problems. Students may participate in one or more projects counseling persons with hearing impairments about legal problems walk-in clinic usually held on the Gallaudet College campus; (2) pa paring and participating in workshops for hearing impaired perso acquaint them with their rights and obligations under the law; (3 sisting in representing the interests of deaf and hearing impaired perso in judicial and administrative proceedings; (4) preparing research p on topics related to law and the deaf, or preparing handbooks exp ing legal topics to the hearing impaired. Students may learn some language, but will be assisted by trained translators when dealing deaf individuals. Approximately 60 hours of work per semester required for each credit hour. Students may repeat this course to maximum of eight semester hours of credit. This course may not taken at the same time as Law 345, or any litigating activities in Law The grade of *CR* (Credit) or *NC* (No Credit) is given for this cou **(Fall, spring, summer—as arranged)**

Staf

399 **Clinical Law Work** (arr.)

Projects involving litigation, research, or public interest activities of legal nature (including aid to indigents, support of public interest profit corporations, and support of governmental agencies or courts) be initiated and will be supervised by a faculty member. Projects must approved in advance by the Law Center Supervisory Committee members) both as to whether the project is appropriate and as to number of semester hours of credit to be granted. A maximum of semester hours of credit may be taken in one or two semesters. course is open to a limited number of third-year law students. The *CR* (Credit) or *NC* (No Credit) is given for this course. (Fall spring)

Advanced Courses

ADMINISTRATIVE LAW: ECONOMIC REGULATION

Faculty Advisers: R.E. Park, G.E. Weston

Peterson

403 **Public Economic Policy and the Law** (2)

Interrelation of law and economics in such subject-matter categories decisional contexts as economic regulation of industry, fiscal policy ning, government research and development practices, foreign trade investment, and public spending priorities. (Research Paper) (Spring —evening)

404 **Securities Regulation** (2) Stevenson, Matthews, K

State and federal laws governing offering and distribution of securities the public by corporate issuers and others, regulation of securities markets

rights and liabilities of purchasers under such statutes. Emphasis on statutes administered by Securities and Exchange Commission. (Take-home Examination) (Fall—evening; spring—day)

405 **Regulation of Securities Markets** (2) Pitt, Sonde

Operation of over-the-counter and exchange markets, including competitive and non-competitive practices in each market; relationship of antitrust laws and securities regulations to concept of a free and open market place; role of regional exchanges and third market in providing competitive element in market. The seminar will examine the regulatory scheme established under the Securities Exchange Act of 1934, particularly as amended in 1975. The seminar will also examine the entire relationship of the antitrust laws with securities regulation. A background in corporations, securities law, and administrative law is helpful but not required. (Take-home Examination) (Spring—evening)

411 **Administrative Practices and Procedures (Food and Drug Administration)** (2) Rothschild, Turner

The study of FDA administrative procedures for the purpose of investigating the significance that administrative practice has on regulatory activity. The course will consider FDA rulemaking procedures in general, a step-by-step consideration of the various hearing procedures now available under the new agency practices and procedures, and problems designed to enable the practical application of rulemaking and hearing procedures to achieve resolution. Prequisite: Law 372. (Research Paper) (Fall—evening)

412 **Food and Drug Law** (2) Kaplan, Becker

The Federal Food, Drug, and Cosmetic Act, and related laws. Consumer, government, and industry viewpoints. (Choice of Research Paper or Examination) (Spring—evening)

413 **Public Policy and Mass Media** (2) Barron, Secrest

Institutional structure of mass media and their interrelationships; psychological aspects of mass communications; continuing adjustments among public interest goals, the economic system, and technological developments; influence of and controls exercised by government, other institutions, and private groups; conflict between freedom of speech of the media and other major community interests; the media's relationships to the interests of dissident and minority groups and the access of these groups to the media. Barron—(Examination or Research Paper); Secrest—(Research Paper) (Fall—day; spring—evening)

414 **Regulated Industries** (2) Park

Substantive problems of business regulation in terms of natural monopolies, licensed industries, subsidized industries, and safety regulation. Typical problems raised include the role of intervenors, the impact of regulation upon management and market behavior, the uses and abuses of economic evidence, the role of agencies' staffs, interagency planning and regulation, and the effects of judicial and legislative review. Each student selects one industry and develops an insight into economic regulation in terms of that industry's firms, market structure, growth and development, trade associations, and regulatory agencies. (Research Paper)

417 **Seminar: Trade Regulation** (2) Weston, Bodner

Group study of current problems relating to unfair trade practices and federal antitrust laws. (Research Paper) (Spring—evening)

Master of Laws candidates in the area of Administrative Law: Economic Regulation who have not taken the following courses or their equivalent as part of a Juris Doctor or Bachelor of Laws program should include them in their Master's program.

329 *Unfair Trade Practices*
330 *Federal Antitrust Laws*
372 *Administrative Law*

Other Related Courses

494 *Use and Control of Nuclear Energy*
505 *Intergovernmental Relations I*
506 *Intergovernmental Relations II*
571 *Land Development Planning*

CORPORATION LAW

Faculty Advisers: R.B. Stevenson, Jr., L.D. Solomon

424 **Business Planning** (2) Stevenson, Flyer, Lewis, Berkele

Integrated study of corporate, financial, tax, accounting, and SEC aspect of the following: organization of a small corporation; organization of public corporation; stock dividends, recapitalization, and stock repurchase in the context of conflict between active stockholders of a closed corporation and the family of a deceased active stockholder; corporate liquidations; corporate mergers and acquisitions; and divisions of corporations. Prerequisite: Law 312, 336, and 340. Enrollment may be limited by the professor. (Problem Assignments) (Fall and spring—evening)

426 **Introduction to International Economic Law** (2) Stevenson

Principles and processes of international law relevant to transnational economic transactions between private parties, including protection of aliens (individual and corporate) within national legal systems; protection by states of the economic interests of their nationals; act of state doctrine; expropriation, and the protection of alien-owned property; development of international law affecting transnational economic transactions through the decisions of national tribunals and through treaties and international agreements, adjudicatory jurisdiction of municipal tribunals and the enforcement of foreign judgments in the international context; international commercial arbitration; special problems of national and international regulation of transnational business transactions. Law 426 is recommended as a foundation for Law 427. (Examination)

427 **Legal Aspects of International Business Transactions** (2) Nurick, Ste

U.S. law and practice, including current tax problems and U.S. restrictions on investment; brief comparison with British and civil law systems; international law, international contracts, choice of law; currency considerations; effect of SEC laws and regulations; international trade, including GATT and reciprocal trade arrangements; sources of finance, both United States and foreign, private and public, including international institutions; protection of property, settlement of disputes, and selected country studies. In addition to the regular lecturers, there will be guest lecturers

various specialties. Emphasis on current problems in international trade and investment. (Choice of Research Paper or Examination) **(Fall—day; spring—evening)**

Master of Laws candidates in the area of Corporation Law who have not taken the following courses or their equivalent as part of a Juris Doctor or Bachelor of Laws program should include them in their Master's program.

312 *Corporations*
313 *Sales and Sales Financing*
329 *Unfair Trade Practices*
330 *Federal Antitrust Laws*
340 *Taxation—Federal Income, Corporations and Shareholders*

Other Related Courses

331 *Product Liability*
403 *Public Economic Policy and the Law*
417 *Seminar: Trade Regulation*
431 *Government Procurement Law*
525 *Copyright Law*
526 *U.S. Trademark Law: Selection, Use, Registration, Protection, and Franchising of Trademarks*
555 *Taxation—Special Corporation Problems*
562 *Income Taxation of Foreign Business and Investment*



GOVERNMENT PROCUREMENT LAW

Faculty Advisers: J. Cibinic, Jr., G.J. Ginsburg, R.C. Nash, Jr.

431 **Government Procurement Law** (3) Nash, Cibi

Survey of the law pertaining to government procurement, including analysis of the unique features of government contracting and a discussion of the functions of Congress, the executive branch, and the courts in procurement process. Law 355 *Government Contracts* is the substantial equivalent of this course. (Examination) (Fall—evening)

433 **Performance of Government Contracts** (3) Nash, Cibi

Discussion of the substantive legal problems that most frequently arise during the performance of government contracts. Interpretation of specifications and the most generally used contract clauses, and analysis of the rights of the parties when performance in accordance with the terms of the contract is not obtained. (Examination and Problem Assignments) (Fall—evening)

434 **Government Contract Claims and Litigation** (2) Nash, Ginsburg

Analysis of the methods which can be used by the parties to a government contract to obtain legal relief, including detailed coverage of the disputes procedure, actions for breach of contract, and forms of equitable and extraordinary relief. (Examination and Problem Assignments) (Spring—evening)

435 **Seminar: Government Contracts** (2) Nash, Cibinic, Ginsburg

Research and discussion of selected problem areas. (Research Paper) (Spring—day)

Other Related Courses

424 *Business Planning*
427 *Legal Aspects of International Business Transactions*
442 *Labor Standards*
494 *Use and Control of Nuclear Energy*
495 *Legal Protection against Technological Hazards*
505 *Intergovernmental Relations I*
506 *Intergovernmental Relations II*
535 *Negotiation: Concepts and Techniques*

LABOR LAW

Faculty Advisers: J.M. Albert, L.S. Merrifield, D.P. Rothschild

441 **Seminar: Disability Problems** (2) C. John

Workman's compensation law, extension of no-fault principle into motor vehicle area, and national health problems. (Examination) (Fall—evening)

442 **Labor Standards** (2) Ginsburg

Analysis of the Fair Labor Standards Act, its scope and exemptions, the Civil Rights Act and other labor statutes; the laws establishing labor standards for government contracts, including the Davis-Bacon, Walsh-Healey Act, Service Contract Act, and Work Hours Act; the

of the Department of Labor, the Comptroller General, and the contracting agencies in interpretation, administration, and enforcement of these statutes. (Examination) (Spring—evening)

443 **Labor Relations in the Federal Service** (2) Tobias

Survey of labor relations in the federal service as governed by Executive Order 11491. Emphasis on the role of the Civil Service Commission, the Department of Labor, the Congress, and the President in the development of collective bargaining relationships between unions and the federal government. (Research Paper) (Fall—evening)

444 **The Individual and The Union** (2) Cushman

Study of the legal relations between unions and their members with special emphasis on the right to fair representation, the right to union membership, compulsory union membership, the imposition of discipline upon union members, reporting requirements, the conduct of internal union elections, the fiduciary duties of union officers, the imposition of trusteeships, the regulation of racketeering, and political action of unions. Prerequisite: Law 341 (Examination) (Fall—evening)

445 **National Labor Relations Board Procedures** (2) DuRoss

A survey of the National Labor Relations Board's unfair labor practice procedures. The course is designed to provide a broad exposure to all aspects of the National Labor Relations Board's practice, including a survey of the remedies and the particular procedures utilized by the National Labor Relations Board to secure such remedies. Prerequisite: a basic labor law course. (Research Paper) (Fall—evening)

446 **Equal Employment Opportunity** (2) Ginsburg

This course covers the spectrum of federal laws and executive orders relating to all types of discrimination in employment, including Title VII of the Civil Rights Act of 1964, as amended by the Equal Employment Opportunity Act of 1972; the Equal Pay Act of 1963, as amended in 1972; the Age Discrimination in Employment Act; the Civil Rights Act of 1866; the Fourteenth Amendment; the National Labor Relations Act; Executive Orders 11246 and 11375 relating to government contractors (including the "Philadelphia Plan" and other government-imposed "affirmative action" plans and bid conditions, and Revised Order No. 4 relating to sex discrimination). The course includes the substantive and procedural rights available to employees of firms doing business with the government, as well as those of other private firms and state and local government agencies subject to the above federal legislation. (Examination) (Fall—evening)

447 **Seminar: Labor Law** (2) Merrifield, Chanin

Group study of contemporary problems of labor law. The evening section is devoted exclusively to problems of the public sector. (Research Paper) (Spring—day and evening)

448 **Seminar: Labor Litigation** (2) Driesen

Intensive study of recent Supreme Court and appellate court decisions in the area of labor law, special emphasis on the contrasting variables which influence the respective decision-making processes of the National Labor Relations Board and the courts. Particular attention to labor law cases pending before the Supreme Court for decision during the current term. Analyses of the briefs filed in pending cases; attendance at oral argument; post mortems of the arguments and decisions, with classroom participa-

tion by attorneys involved in some cases. Enrollment may be limited ... mission by permission of instructor. Prerequisite: Law 341. (Rese... Paper) (Spring—evening)

450 **Equal Employment Claims and Litigation** (2) Harris

Litigation in federal court of a claim of employment discrimination. P... lems faced by attorneys for both plaintiff and defendant; practice in d... ing pleadings which the attorneys for the parties would prepare in liti... a claim of employment discrimination. (Examination) (Spring—e... ing)

Master of Laws candidates in the area of Labor Law who have not taken th... following courses or their equivalent as part of a Juris Doctor or Bachelor... Laws program should include them in their Master's program.

339 *Collective Bargaining and Labor Arbitration*
341 *Labor Law*

Other Related Courses

459 *Problems of the Consumer*
460 *Current Problems in Civil Rights*

LAW AND POVERTY

Faculty Advisers: D.P. Rothschild, J.E. Starrs

Mo...

451 **Federal Poverty Legislation** (2)

Students are given a chance to observe at first hand the problems inher... ent in implementing a federal policy to alleviate poverty through legis... tion. Students are assigned to work with individual poverty agencies... the District of Columbia on matters relating to the federal funding of... cies. Discussions focus on various aspects of poverty law problems... lawyers deal with them—from conception of the legislative program... Congressional debate, to administrative policies, to fund distribution... litigation. (Research Paper)

Rothschild

459 **Problems of the Consumer** (2 or 3)

Clinical treatment of consumer protection. Minimum of 8 hours w... commitment each week required; 2-hour weekly class required in addi... tion for 3 credits. Students purchase consumer protection materials... text, and are divided into projects groups. For example, the National L... Center has negotiated with a commercial TV station to put on a series... news spots dramatizing consumer problems and also runs a "Consu... Help Center." This activity involves three groups: (1) a group to... with the station on programming, (2) a group to run the Consumer... Center, and (3) a research group to investigate the results of consu... intake, referral, and disposition. Other students work in inner-city ... fronts, with county government agencies, and on the editorial staff of ... *Consumer Protection Reporting Service*. The grade *CR* (Credit) or *NC* (No Credit) is given for this course. May be repeated once for ... credit not to exceed 6 hours. (Fall and spring—day; summer ...

460 **Current Problems in Civil Rights** (2) Rearden

Uses of law in the effort to achieve racial equality in areas such as (1) discrimination against minority groups and the poor in land use and zoning, (2) school desegregation, and (3) employment discrimination. The class is divided into groups, each dealing with a problem situation in one of these areas. Students represent fictitious clients, write briefs, and argue in class before a student panel of judges, which then writes an opinion. Grades are based on these written and oral presentations, plus brief critiques of other groups' presentations. Enrollment limited by the instructor. **(Problem Assignments) (Fall—evening)**

Other Related Courses

441 *Seminar: Disability Problems*
475 *Law and Criminology I: Search for the Causes of Criminal Behavior*
476 *Law and Criminology II: Society's Responses to the Criminal Offender*
560 *Taxation—State and Local*
571 *Land Development Planning*
575 *Community Economic Development*
592 *Seminar: Constitutional Law*

LAW, PSYCHIATRY, AND CRIMINOLOGY

Faculty Advisers: T.F. Courtless, Jr., E. Zenoff, G.M. Caplan

473 **The Crime Lab, the Forensic Scientist, and the Criminal Lawyer** (2) Starrs, Kogan, Nelson

Designed to acquaint the student with the operations of a modern crime laboratory and the courtroom acceptability of testimony of forensic scientists and other evidence on laboratory test results. Identification of individuals (fingerprints, palmprints, footprints, voiceprints, anthropological reconstruction, hair identification, and serology), identification of objects (ballistics, handwriting, typewriting, fiber identification, paints, varnishes, glass, wood, and paper), toxicology, pathology, forensic use of the microscope and the camera, the coroner and the medical examiner systems, and drug law enforcement. Visual aids, crime laboratory guest lecturers, and field trips to crime laboratories. (Research Paper) (Fall—evening; spring—day)

475 **Law and Criminology I: Search for the Causes of Criminal Behavior** (2) Courtless

Role which criminological knowledge of crime causation may play in assisting lawyers to appraise the effectiveness of various alternative social and legal devices in controlling deviant behavior. The search for factors related to criminal behavior will be developed historically, with emphasis on current causal theories developed by various disciplines. Model as well as operational penal codes, sentencing and probation practices, and specialized facilities will be analyzed in terms of their relationship to such causal theories. **(Research Paper)**

476 **Law and Criminology II: Society's Responses to the Criminal Offender** (2)

Study of the development and current use of society's three major proaches to the handling of offenders: punitive, mechanical, and co tional. Emphasis on society's changing responses to criminal and de quent behavior, and research findings concerning effectiveness of responses. Analysis of treatment strategies to facilitate communic between members of the legal profession and behavior scientists a with effectuating these strategies. Prerequisite: Law 475. (Res Paper)

477 **The Police and the Community** (2)

Problems and potential of contemporary urban law enforcement; the and perspective of the police officer; the police *qua* organization; of law enforcement; law enforcement in the inner city; relationship ethnic minorities; civil disorder; police-community relations, media arrest and investigation; complaint review procedures; science and nology in law enforcement; police handling of juveniles; crime and statistics. (Problem Assignments)

479 **Seminar: Criminal Practice** (2)

Tactical and practical applications of criminal law; mastery of techniq in trying criminal cases. Class sessions built around mock p based on actual criminal cases; student role-playing as defense and prosecutors. All phases of criminal trial work covered client tions, investigation, discovery, trial preparation; particular emphasis courtroom techniques—direct and cross examination, impeachment freshing recollection, laying foundations for exhibits, argument, courtroom demeanor. Though many of the mock problems are from a defense viewpoint, techniques taught are relevant to both tion and defense. Enrollment limited to 15 third-year and graduate dents. Prerequisite: Law 334. Students may elect to receive numerical grade or the grade *CR* (Credit) or *NC* (No Credit). spring—evening)

480 **Law of Criminal Corrections** (2)

Study of two principal areas: (1) sentencing procedures, including bation, parole, and imprisonment; (2) legal rights of prisoners. ment limited to 25 students. Students who receive credit for Law cannot receive credit for Law 478. (Examination) (Fall—eve

485 **Seminar: Health Care Delivery Systems** (2)

Study of the role of the lawyer in existing and proposed national syste for delivering health care. Students will gain familiarity with cepts and terms in health care delivery by working with issues design, finance, and administration of existing arrangements ev of the means of reconciling the expectations of various groups care service consumers and providers. (Research Paper) evening)

486 **Seminar: Law and Psychiatry** (2)

Designed to expose the lawyer to basic constructs of psychiatry psychology and to explore their implications in legal rules and pra Psychiatrists and psychologists actively involved in teaching Topics include psychological testing and other assessment

psychiatric evaluations and reports, child custody and other family law issues, privilege and confidentiality, competency in civil and criminal contexts, criminal law matters (including criminal responsibility and dispositional issues), civil commitment, right to treatment, right to refuse treatment, experimental procedures, and informed consent. Problems of counseling, legal ethics, preparation for trial, direct and cross examination, and other aspects of practice considered. There is ordinarily at least one session in a mental institution. (Research Paper) (Summer 1979)

487 **Juvenile Justice** (2) Zenoff

Exploration of the rights of children in intra-family disputes and in conflicts between the child and the state. Includes the rights of children to life (abortion and medical care), a home (neglect and adoption), education, liberty (status offenses, delinquency, hospitalization for mental disability). (Research Paper)

Other Related Courses

390 *Law and Medicine*
591 *Legislative Drafting*
592 *Seminar: Constitutional Law*

LAW, SCIENCE, AND TECHNOLOGY

Faculty Adviser: J.P. Chandler

491 **Computers and the Law** (3) Chandler

A critical study of selected major legal problems presented by new computer technology, including the impact upon legal doctrine and legal institutions. Jurimetrics, the theory of various uses that are and may be made of computers in legal research, the practice of law, and court administration will be examined. Familiarity with the rudiments of computer science or programming would be helpful, but is not required. (Examination) (Summer—1979)

492 **Seminar: Science and the Legal Process** (2)

Reciprocal relationships between law and science; absorption of scientific concepts into substantive law through adjudication, legislation, and rule-making techniques and procedures used in handling, developing, and deciding scientific issues. (Research Paper)

494 **Use and Control of Nuclear Energy** (2) Malsch

Development of law and legal institutions to deal with revolutionary scientific developments in nuclear energy. Laws and regulations concerning peaceful uses of nuclear energy, including licensing, safety, environmental, security, and antitrust considerations. (Research Paper) (Spring—evening)

495 **Legal Protection against Technological Hazards** (2) Dembling, Brown

The growth and development of law and legal institutions to protect society against the hazards inherent in new technologies with particular emphasis on the progress of reconciling the protection of the public with the desire for rapid progress. (Research Paper)

Other Related Courses

412 *Food and Drug Law*
413 *Public Policy and Mass Media*
431 *Government Procurement Law*
505 *Intergovernmental Relations I*
508 *Environmental Law I*
509 *Environmental Law II*
531 *International Law of Air and Space*
532 *International Law of the Sea*

LAND USE MANAGEMENT AND CONTROL

Faculty Advisers: J.M. Brown, L.A. Schiller, J.P. Chandler

501 **Land Development Law** (3)

Study of the basic public and private means used by society to manage and control land use, such as zoning, subdivision regulation, pending [illegible] eminent domain, and privately contracted conditions, covenants, and restrictions. Identification and analysis of emerging new land control processes and the roles played by public and private entities involved in [illegible] affected by land use management and control efforts at the various echelons of government. Students participate in a game-simulation process representing a specific complex situation in land use conflicts involving their inherent technological, social, economic, political, and legal elements. In the model situation students will assume roles as attorneys and work with assigned "clients." (Client-oriented written work and class participation.) Enrollment limited by the instructor. (Fall—day; summer [illegible]

504 **Seminar: Current Problems in Land Use Controls** (2)

New and emerging concepts of regionalism considered in the light of actual problem situations and attempts being made by various echelons of government to provide effective and equitable land use management and control. Examination of actual problem areas of major concern, including constitutional, administrative, political, judicial, social, economic, and technological elements. Functional planning and decision-making with respect to selected problem areas and their strategical and tactical transactions examined within the compass of the broader policy considerations involved. Guest lecturers; clinical exposure to various government agencies responsible for cooperating with the selected problems. (Research Paper) (Spring—day)

505 **Intergovernmental Relations I** (2)

Study of federalism, emphasizing current techniques for achieving cooperation and coordination between federal, state, and local governments. Detailed consideration of devices used, including interstate compacts, grants-in-aid, and exercise of regulatory powers. (Research Paper) [illegible]

506 **Intergovernmental Relations II** (2)

Advanced seminar on multi-government activities and current issues in intergovernmental relations. (Research Paper)

Master of Laws candidates in the area of Land Use Management and Control who have not taken the following courses or their equivalent as part of a J.D.

Doctor or Bachelor of Laws program should include them in their Master's program.

327 *Modern Real Estate Transactions*
372 *Administrative Law*
508 *Environmental Law I*
509 *Environmental Law II*

Other Related Courses

460 *Current Problems in Civil Rights*
494 *Use and Control of Nuclear Energy*
495 *Legal Protection against Technological Hazards*
558 *Taxation—Real Estate and Income*
560 *Taxation—State and Local*
591 *Legislative Drafting*
593 *Seminar: American Legal History*

ENVIRONMENTAL LAW

Faculty Adviser: A.W. Reitze, Jr.

508 **Environmental Law I** (3) Reitze

The National Environmental Policy Act. Water pollution and drinking water protection; other pollution topics may be covered. This course and Law 509 recommended for second-year J.D. students interested in this field. (Examination) **(Fall—day; spring—evening)**

509 **Environmental Law II** (3) Reitze

A continuation of Law 508, but designed so that a student can begin with this course. Air pollution and related energy legislation. (Examination) (Spring—day)

510 **Water Resources Law** (2) Hedeman

Federal State powers over water: Riparian and prior appropriation doctrines; Indian and reserved rights; groundwater law. Federal programs for water resources development; federal permit programs. Wetland protection and coastal zone management. (Examination) (Fall—evening, summer 1979)

511 **Environmental Planning** (2) Schnidman

Introduction to environmentalism in land use planning, zoning, subdivision controls, growth control. State and Federal land use planning. Case studies of environmentally sound planning. Enrollment limited to 35 students. (Research Paper) **(Fall—evening)**

512 **Energy** (2)

Federal energy policy. A survey of federal laws controlling petroleum and natural gas. Energy conservation laws. Introduction to electric utility regulation emphasizing production conservation; rate structures, demand controls. Enrollment limited to 35 students. (Examination) **(Spring—evening)**

513 **Environmental Litigation** (2) Miller, Steenland, F

Special problems of environmental lawsuits. Topics include pleading procedural problems, selection of the proper court, problems of remedies, selection of parties, discovery techniques and trial prepa and the use of expert witnesses and scientific evidence. Prere Law 508 or graduate status. Enrollment limited to 35 students. of Research Paper or Clinical Work) (Fall—day; spring—even

514 **Natural Resources Law** (2) Hon

Introduction to public lands; recreation, forestry, grazing, and mining l Continental shelf development, Alaskan development, western ener velopment. Wilderness Act, wild and scenic rivers, national trails. W laws. Soil conservation and surface mining. (Examination) (F evening)

516 **Clinical Studies in Environmental Law** (2, 3, or 4) Re

The student works on a project in the environmental law field under supervision of both the faculty director of the program and a practicing environmental law. The project may involve working w government agency, a congressional committee, a private practitioner, a nonprofit public-interest environmental organization. Admission to course requires second-semester second-year, third-year, or graduate stu ing and permission of the Director of the Environmental Law Progra Students who have mastered the fundamentals of environmental law selected for this course. Normally this will require completion of Law 508. Students may repeat this course for a maximum of 8 sem hours of credit. The grade *CR* (Credit) or *NC* (No Credit) is give this course. (Fall and spring—day)

Master of Laws candidates specializing in Environmental Law or Land U Management and Control may use the following courses to complete the gree requirements.

598 *Research in Public Law*
599–600 *Thesis*

Other Related Courses

413 *Public Policy and Mass Media*
431 *Government Procurement Law*
492 *Seminar: Science and the Legal Process*
494 *Use and Control of Nuclear Energy*
495 *Legal Protection against Technological Hazards*
501 *Land Development Law*
505 *Intergovernmental Relations I*
506 *Intergovernmental Relations II*
532 *International Law of the Sea*
560 *Taxation—State and Local*
571 *Land Development Planning*
591 *Legislative Drafting*

PATENT AND TRADE REGULATION LAW

Faculty Advisers: I. Kayton, G.E. Weston

522 **Patent and Know-how Licensing** (2) Brunsvold

The business and legal criteria necessary to implement and maintain successful licensing programs; emphasis on the strategy and techniques that permit a proprietor of intellectual property to effectively exploit his status as the owner of a unique form of property. Subject areas covered are business objectives in licensing; legal outline of licensing situations; rights and duties of license parties; factors in selecting which inventions to license—financial, legal, and commercial; finding and selecting the right licensees; determining and negotiating the terms and clauses of the contract; administering and enforcing the license; antitrust and misuse constraints on the business and law of licensing; tax factors affecting the patent and know-how contract; special problems in trade secret, know-how, and show-how contracts; international licensing. Prerequisite: Law 359 and 362. (Choice of Research Paper or Examination) (Spring, odd years—evening)

523 **Court Review of Patent Office Decisions** (2) Dunner

Procedure and procedural law involved in appealing to the U.S. Court of Customs and Patent Appeals and the U.S. District Courts from administrative decisions in the U.S. Patent Office. Designed to provide an exhaustive step-by-step procedural progression through *ex parte* and *inter partes* patent and trademark appeals. Emphasis on the forms used in the many motions and proceedings before the U.S. Court of Customs and Patent Appeals and the District Courts required to perfect an appeal. Attendance at and critique of actual court proceedings. Introductory material includes administrative appeals before the U.S. Patent Office Board of Appeals. Prerequisite: Law 359 and 362, or the equivalent in experience. (Examination) (Fall, even years—evening)

524 **Chemical Patent Practice** (2) White

Seminar covering patent application preparation, prosecution, appeals, and licensing which are peculiar to chemical patent practice. Prerequisite: Law 359 and 362, or former Law 360; or comparable experience in the practice of patent law. (Examination) (Fall, even years—evening)

525 **Copyright Law** (3) Moore

Historical background; formalities and essentials in securing a copyright; subject matter of copyright; remedies; international aspects of copyright under Berne Union, Universal Copyright Convention, Inter-American Convention; copyright licensing and performing rights societies. (Examination) (Spring—evening)

526 **U.S. Trademark Law: Selection, Use, Registration, Protection, and Franchising of Trademarks** (2) Leeds

Procedural and substantive law on use, registration, and protection of trademarks, including detailed registration procedure in the U.S. Patent and Trademark Office, common law rights to marks, and licensing and franchising arrangements. Prerequisite: Law 329. (Examination) (Fall, odd years)

528 **Patent Interference Practice** (2) Klitzma

Procedure and practice in inter partes determination of priority of inve tion in the U.S. Patent Office. Topics: conception, reduction to pra diligence, corroboration, preliminary statements, motions, and te mony practice and final hearing. Also covered are current problem such as inventor determination, discovery, and privilege. Students re quired to draft procedural document selected from categories of prelim nary statements and various interference motions. Prerequisite: La 359 and 362, or former Law 360. (Examination) (Spring, even years

529 **Research in Patent, Trademark, and Copyright Law** (2) Kayto

Prerequisite: Law 417, and related courses; and a *B* average. Request writing, with proposed outline of topic of research, must be submitted the Dean at least one month prior to registration day. Work must completed within the semester and paper submitted not later than last da of classes. Graduate students may repeat this course once for credit wi the approval of the Dean. (Research Paper)

Master of Laws candidates in the area of Patent and Trade Regulation Law who have not taken the following courses or their equivalent as part of a Juris Doctor or Bachelor of Laws program should include them in their Master's program

329 *Unfair Trade Practices*
330 *Federal Antitrust Laws*
359 *Patent Law*
362 *Patent Office Practice*

Other Related Courses

412 *Food and Drug Law*
417 *Seminar: Trade Regulation*
427 *Legal Aspects of International Business Transactions*
431 *Government Procurement Law*
492 *Seminar: Science and the Legal Process*
562 *Income Taxation of Foreign Business and Investment*

INTERNATIONAL AND COMPARATIVE LAW

Faculty Advisers: International Law—W.T. Mallison
Comparative Law—G.R. Delaume

531 **International Law of Air and Space** (2) Dembitz

Study of the development of international law relating to the use of a space and outer space; analysis of air and space treaties in force; the rol of various intergovernmental and nongovernmental international tions; consideration of special problems such as liability resulting fro space activities, space technology and arms control, and p contamination of outer space; earth resources, sensing, etc limited to 25 students. (Research Paper) (Fall—evening)

532 **International Law of the Sea** (2)

International law affecting allocation of authority over ocean velopment of international law concerning territorial sea, con high seas, continental shelf, and deep seabed. Current legal issues associated with these areas. (Examination) (Spring—ev

533 **International Humanitarian Law of Coercion Control** (2) Mallison, Jabri

(Formerly Legal Regulation of International Coercion)

Process of legal decision concerning international conflicts and civil wars, including the protection of war victims, control of international terrorism, problems concerning weapons of mass destruction, war crimes and punishment, and problems of preserving human and material values by transforming coercion situations to minimum order ones. Consideration will be given to the four Geneva Conventions of 1949 for the Protection of War Victims, the Geneva Protocols of 1977, and current problems in the application of humanitarian law. (Research Paper) (Spring—day)

534 **U.S. Foreign Relations Law** (2) **Chandler**

Seminar involving the study of foreign relations law. Materials to be read and discussed relate to the Constitutional and other public law problems which arise in the development and conduct of U.S. foreign relations. (Research Paper) (Fall—evening)

535 **Negotiation: Concepts and Techniques** (2) Ramundo, Tankel

Role of the lawyer and policy maker (client) in private, intragovernmental, and international negotiations; negotiations in private practice and governmental operations; achievement of consensus among contentious parties; negotiating techniques, including effective use of the "fallback"; gaming exercises in the actual conducting of negotiations, with practical work in the preparation of claim letters, agency and national positions, and negotiating instructions. Enrollment limited by the instructors. (Writing Assignments) (Spring—evening; summer 1979)

536 **Diplomatic and Consular Law and Practice** (1) Mitchell

Development of diplomatic and consular relations between nations; legal rights, privileges, functions, and immunities of diplomatic and consular personnel; extent of immunity from jurisdiction of foreign government missions and representatives; problems of taxation affecting foreign government missions and personnel. (Research Paper)

537 **The International Law of Human Rights** (2) **Fruchterman**

Development of the rights of man from Grotius through the American and French Revolutions to the work of the United Nations in the field of human rights; the individual vis-a-vis the State; the regional approach to international protection of human rights, with emphasis on the European Convention; the inter-American, African, and Socialist approaches; human rights in armed conflict; and terrorism as a basic deprivation of human rights. (Research Paper) (Fall—evening)

540 **Choice of Law and Forum in Transnational Contracts, Techniques of Conflict Avoidance** (2) Delaume

Problems confronting the practitioner who endeavors to anticipate conflicts before they arise. Conflicts rules for transnational contracts, internationalization of contracts involving sovereign and international organizations. Techniques of conflict avoidance; express choice of law; conflict avoidance in absence of express stipulation of applicable law. Effectiveness of conflict avoidance; interrelationship of conflicts law and comparative law. (Research Paper)

542 **U.S. Regulation of International Trade** (2) Johns

Study of theory and practical application of United States laws, re lations, and governmental infrastructure affecting international Public international fora and agreements influencing U.S. regulation, GATT, the MTN, UNCTAD, and treaties of friendship, commerce, navigation; constitutional basis for U.S. government regulation of national trade; exemplary areas of trade regulation: Export Ad tion Act, foreign assets control, tax, Foreign Corrupt Practices Arab boycott regulations, antitrust, countervailing duties, impor for domestic industries, East-West trade, generalized system of p ences and tariff nomenclature. (Examination) (Spring—even

546 **Soviet Law** (2) Ramse

Concept of "socialist legality"; legal relationship of individual to state o other participants in Soviet society; role of Party in Soviet legal s Soviet philosophy of law; state (constitutional) law: Soviet tec governmental apparatus, rights and obligations of citizenship; crimi law; property law; labor law; selected topics in civil law and pro international law. (Choice of Paper or Examination) (Fall ev

547 **Chinese Law** (2)

Emphasis on the legal system of Communist China; analysis of the stitutional law of China, including general principles, state structu rights and duties of citizens; a brief survey of the administration of tice—courts, procuratorates, and lawyers; marriage law; land law, revolutionary act and other criminal statutes; principles of civil law munist Chinese concept of international law. (Research Paper) evening)

548 **Law of the Near East** (2)

Law of the Arab countries, Turkey, and Iran, including basic prin Islamic law, analysis of the present day codes, and investigation of Western influences on laws of these countries. (Examination)

Master of Laws candidates in the area of Public International and Comparati Law who have not taken the following courses or their equivalent as part o Juris Doctor or Bachelor of Laws program should include them in their Ma ter's program.

302 *Admiralty*
303 *International Law and World Order*
304 *United Nations Law and World Order*
307 *Comparative Law*
309 *Conflicts of Laws*

Other Related Courses

427 *Legal Aspects of International Business Transactions*
494 *Use and Control of Nuclear Energy*
505 *Intergovernmental Relations I*
506 *Intergovernmental Relations II*
562 *Income Taxation of Foreign Business and Investment*

TAXATION

Faculty Advisers: J.R. Hambrick, D.B. Weaver, L.D. Solomon

551 Taxation—Partnerships and Subchapter S (2) Weaver, Sanders

Income tax problems of partnerships and tax-option corporations (Subchapters K and S of the Internal Revenue Code of 1954). Prerequisite: Law 336. (Examination) (Spring—evening)

553 Seminar: Estate Planning (2) Weaver, McCoy, Solomon

Study of the effective disposition of wealth by inter vivos gift and testamentary transfer; emphasis on income, estate, and gift tax considerations; use of the trust form in the transfer of wealth; use of insurance and jointly held property as part of the estate plan; planning for the continuation or disposition of the client's business interests. Preparation of an estate plan, with supporting documents is the major project for the course. Prerequisite: Law 325, 326, 336, and 338. Enrollment limited by the instructor. (Problem Assignments) (Fall—evening; summer 1979)

554 Taxation—Deferred Compensation (2) Chabot, Lieber

Tax and labor law consequences of deferred compensation. Examination of new standards imposed by Employee Retirement Security Act of 1974. Consideration of tax consequences of "unqualified" plans, lump sum distributions, individual retirement accounts, and new requirement that defined benefit plans be insured by the Pension Benefit Guaranty Corporation. Prerequisite: Law 336. (Problem Assignments and Examination) (Fall—evening)

555 Taxation—Special Corporation Problems (2) Libin, Davis

Detailed study of the principal federal tax benefits of the corporate form of doing business. Consideration of problems involved in the tax planning of the corporate structure and corporate operation, including the tax definition of a corporation, the special deductions available to corporate payers, the compensation of the corporate executive and employee, the debt-equity question, the accumulated earnings tax, the personal holding company tax, multiple corporations, and consolidated returns. Survey of the types of corporations receiving special treatment under the Internal Revenue Code, such as financial institutions, real estate investment trusts, regulated investment companies, cooperatives, and small business corporations. Prerequisite: Law 340. (Research Paper) (Spring—evening)

557 Taxation—Exempt Organizations (2) Hopkins

Tax-exempt organizations: policy and practice of preferred tax treatment for selected organizations and gifts to them. Statutes, regulations, and IRS practice; legislative origins, judicial interpretations, and policy consideration. Tests of qualification, disqualification, and limited tax preference. Mechanics of securing and retaining exemption; qualified exemption; unrelated business income; private inurement, political activity. Denial or loss of exemption. Return and reporting requirements. Comparative tax treatment of nonexempt and nonprofit organizations. Special sanctions with respect to private foundations, managers, and donors for improper, excessive, or prohibited activities. Enrollment may be limited. **Prerequisite: Law 336. (Examination) (Fall—evening; summer 1979)**

558 **Taxation—Real Estate and Income** (2)

The effect of income taxes on the real estate market and real estate actions: sales and exchange of real estate interests; various entities ownership and development of real estate; the impact of taxes landlord and tenant; the impact of taxes on the mortgagor and mortg including the choice of financing techniques, such as the sale-lease depreciation, amortization, and obsolescence; basis and basis adjust and casualties and other involuntary conversions. Prerequisite: Law (Examination) (Spring—evening)

559 **Taxation—Oil and Gas** (2)

Application of federal income tax law to producing segment of oil a gas industry. Classification of interests; treatment of exploration and velopment expenditures. Depletion allowance and concept of "e interests." Sales vs. "leasing" transactions. Organization problems requisite: Law 336. (Examination)

560 **Taxation—State and Local** (2)

Taxation by state and local governments; problems of real and perso property taxation, sales and use taxes, business and personal incom taxes. Limitations on taxation of interstate commerce. Conferenc problems. (Choice of Research Paper or Examination) (Spring ning)

562 **Income Taxation of Foreign Business and Investment** (2)

The provisions and policies of the federal income tax law applicab foreign income, including considerations affecting the choice of metho of engaging in foreign business and investment, treatment of con foreign corporations, allocation of income in foreign commerce for foreign taxes, principles and trends of U.S. tax treaties. (Examina (Fall and spring—evening)

564 **Seminar: Special Problems of Tax Policy** (2)

Intensive study of selected aspects of the tax structure with pa tention given to the federal income tax. Problem areas are reviewed p marily from the standpoint of tax policy, including legal, economic, s cial, and practical considerations. Alternative solutions, including rent legislative proposals, are examined. Prerequisite: Law 336. (Research Paper) (Fall—evening)

567 **Seminar: Tax Practice and Procedure** (2)

Review of the major areas of tax practice, including organization of th Internal Revenue Service, legislation, administrative regulations, tax pla ning, tax rulings, tax audit, settlement procedures, claims for refund, ta collection processes, criminal tax practice, and ethical problems in ta practice. Preparation of various documents is required. Pr 5 semester hours of taxation, including Law 336. (Problem Assig (Fall—evening)

568 **Seminar: Federal Tax Litigation** (2)

Choice of forum. Conduct of civil tax cases: trial practice in the T Court, the District Courts, and the Court of Claims; appeal practice in the Courts of Appeals and on certiorari to the Supreme Court; analysis and drafting of pleadings, motions, and briefs; oral argument; settlement

stipulations of fact. Comparative responsibilities and procedures of IRS and of the Department of Justice for litigation control. Prerequisite: Law 567. (Writing Assignments) (Spring—evening)

Master of Laws candidates in the area of Taxation who have not taken the following courses or their equivalent as part of a Juris Doctor or Bachelor of Laws program should include them in their Master's program.

336 *Taxation—Federal Income*
338 *Taxation—Federal Estate and Gift*
340 *Taxation—Federal Income, Corporations and Shareholders*
351 *Law and Accounting*

Other Related Courses

404 *Securities Regulation*
424 *Business Planning*
427 *Legal Aspects of International Business Transactions*

URBAN LEGAL STUDIES

Faculty Advisers: M. Pock, D.P. Rothschild

572 **Land Development Planning** (2) Schnidman
(Formerly Law 571)

Selected problems in urban and regional planning: applications of zoning, urban renewal, and special programs available for the implementation of development plans. Enrollment limited by the instructor. (Examination and Paper) (Spring—evening)

575 **Community Economic Development** (2) Stevenson

A substantive study of the organizational, financial, and tax-planning aspects of nonprofit, cooperative, and small business organizations. Problems illustrating some of the legal considerations of a nonprofit organization and a small business. Consideration of the problems of economic development and current efforts to stimulate it. Enrollment limited to 25 students. Prerequisite: Law 312, 336. (Problem Assignments)

579 **Clinical Studies in Urban Law** (2, 3, or 4) Sirulnik, Staff

Open to second- and third-year students. Participants work in the National Center's Community Legal Clinic, a diverse legal service institution offering a variety of litigation and nonlitigation advocacy opportunities in civil representation. Under the supervision of the Director and two attorney-instructors, such skills as interviewing, counseling, drafting, negotiations, civil litigation, and administrative practice are learned while serving various segments of the city's low-income populace, including representing the elderly through a special program. Third-year students are eligible to participate in the course as student litigators in the District of Columbia Superior Court. Students may also earn credit working for other public interest law institutions or government agencies. Students who perform 10 hours' service each week for the semester receive 2 semester hours of credit, those performing 15 hours' service receive 3 semester hours; those performing 20 hours' service receive 4 semester hours. May be repeated for credit not to exceed 8 semester hours. This course may not be taken at the same time as Law 345, or any litigating activities in Law 346. The grade of *CR* (Credit) or *NC* (No Credit) is given for this course. (Fall, spring, summer 1979)

Descriptions for the other courses in this area (listed below) appear elsewhere in "Advanced Courses."

459 **Problems of the Consumer** (2 or 3)
501 **Land Development Law** (3)
505 **Intergovernmental Relations I** (2)
506 **Intergovernmental Relations II** (2)
560 **Taxation—State and Local** (2)

Other Related Courses

460 *Current Problems in Civil Rights*
475 *Law and Criminology I: Search for the Causes of Criminal Behavior*
476 *Law and Criminology II: Society's Responses to the Criminal Offender*
592 *Seminar: Constitutional Law*

OTHER ADVANCED COURSES

586 **Immigration Law** (2)

Law and practice under the McCarran-Walter Act, involving questions of immigration, emigration, expatriation, nationality and naturalization. Consular, Immigration and Naturalization Service, and Labor Department practice. (Examination) (Fall—evening)

587 **Individual Rights and Liberties** (3)

Principles of equality and due process in the 5th and 14th amendments. The power of Congress to enforce the 14th amendment. Focus on individual rights and liberties under the U.S. Constitution. First amendment rights, particularly religion and speech clauses. The right of association. Other personal rights in the Bill of Rights. Methodology of judges in deciding cases involving individual rights and liberties, particularly the "balancing test" and the judges' views of societal interests. Prerequisite: Law 212. (Research Paper) (Fall—day)

588 **Legal Problems in Education** (2)

Public policy issues involving individual liberties and governmental obligations examined in the context of government's participation in education. Issues covered include legal framework within which states regulate schools, rights of students and teachers, obligations to avoid discrimination and provide equal educational opportunities, and role of courts, legislators, and educational officials in resolving such issues. (Research Paper)

589 **Seminar: Law of Privacy** (2)

A review of the law of privacy as it has developed in constitutional litigation, tort law, and state and federal statutes. Current developments and rationales for further expansions of privacy rights are considered. (Research Paper) (Summer 1979)

591 **Legislative Drafting** (2)

Advanced instruction and practice in legislative drafting; overview of legislative process with emphasis on legislative drafting. Enrollment limited to 30 students. (Problem Assignments) (Spring—evening)

592 **Seminar: Constitutional Law** (2) Silard, Cheh, Dienes

Group study of contemporary problems in constitutional law: process of constitutional litigation; problems of effectuating constitutional guarantees. Limited enrollment. (Research Paper) (Fall—day; spring—evening)

593 **Seminar: American Legal History** (2) Lowther

From the outbreak of the Revolution at Lexington and Concord to the death of John Marshall. An examination of men, events, and movements significant in the unfolding of our laws and legal institutions in this formative period of our national life, including a critical examination of the place of the lawyer in a revolutionary age. Comparison of the role of the lawyer during the politically and socially unsettled time of Marshall with the role of the lawyer in today's troubled scene. Members of the seminar present the results of their research and thought either by oral or written reports. The grade of *CR* (Credit) or *NC* (No Credit) is given for this course. (Problem Assignments) (Fall—as arranged)

594 **Professional Responsibility** (2) Sharpe, Upton

Ethical problems in civil and criminal litigation. Loyalty to the client. Financing of legal services. Etiquette of acquiring and retaining clients. Procedures and problems in legal discipline. Special responsibilities of the government lawyer. Ethical conduct of judges. Issues in *pro bono publico* practice. Ethical responsibilities of law professors. Plea bargaining. Role of the American Bar Association. (Examination) (Spring—day and evening)

597 **Independent Studies** (arr.) Staff

Limited to teaching fellows. The proposed program of study must be submitted to a faculty member in writing and approved prior to the beginning of the semester. May not be elected for more than 12 semester hours of credit. (Fall and spring)

598 **Research in Public Law** (2) Staff

Limited to graduate students with at least a *B* average who have had a seminar or comparable course in field of proposed research. Students are responsible for obtaining an adviser from the full-time faculty who is willing to sponsor their research. This adviser's name must be submitted to the Dean at registration. Work must be completed within the semester. Students may repeat this course once for credit with the approval of the Dean. (Research Paper) (Fall, spring, summer)

599–600 **Thesis** (2–2)

Students must register for two successive semesters and cannot register for both sections in one semester. (Fall, spring, summer)

620–21 **Legal Research, Writing, and Professional Responsibility and Ethics** (2–2)
(For Foreign Students)

Introduction to and practical experience in the use of a law library; instruction and practice in legal writing, including a memorandum and appellate court brief; instruction and experience in the preparation and argument of an appellate court case; instruction in questions of professional responsibility and ethics. The grade *CR* (Credit) or *NC* (No Credit) is given for this course. For credit, a student must attain a minimum grade of 65. No credit will be given for this course unless it is taken both fall and spring semesters. Failure to complete the work in this course will result in a grade of 45. (Fall and spring—evening)



SPECIAL PROGRAMS IN RESEARCH AND INSTRUCTION

ENVIRONMENTAL LAW PROGRAM

Director A.W. Reitze

The Environmental Law Program seeks to provide both academic and cli cal experience in the environmental law field. The program is predicated u exchange of information and experience between the academic communi the world of the practicing attorney. The result is a forum for presenta discussion, and implementation of legal avenues to cope with the critical vironmental issues of the present and future generations. These goals achieved through courses, seminars, research projects, and clinical activities

GOVERNMENT CONTRACTS PROGRAM

Director R.C. Nash, Jr.

A comprehensive government contracts program provides continuing tion for industry and government personnel in this field and a pro courses leading to the Master of Laws degree in Government Pro Law. The program includes (1) short seminars, (2) one-week courses vanced problems in the field, (3) an annual institute treating a pr contemporary importance, (4) an annual conference in a major area, pilation of materials for use in current courses, (6) publication of a monographs treating special problems in the field, and (7) special projects.

INTERNATIONAL AND COMPARATIVE LAW PROGRAM

Director W.T. Mallison

The objectives of the International and Comparative Law Program are to provide insights into the processes of international law and foreign legal systems. Specific objectives in international law are to provide a better understanding of decision-making, sanction processes, legal institutions, and the relationships between domestic and international law. Specific objectives in comparative law include understanding of the basic institutions of civil law countries, the reception of civil law and common law in non-Western countries, and the role of decisional law and judicial review in selected legal systems. Improvements which are needed to promote the rule of law in the world community are also considered. International aspects of business transactions and economic development are included in the Program. The objectives of the Program are implemented through course work and seminars for both J.D. and post-J.D. degree students and through research and writing in pertinent fields.

LAND USE MANAGEMENT AND CONTROL PROGRAM

Director J.M. Brown

The social, economic, technological, political, and legal interrelationships generated by the fact that land is a basic, limited-supply natural resource, capable of being subjected to differing but concurrent public and private uses, raise a growing number of issues involving management policy and control measures which are of critical concern to the future of the nation. The Land Use Management and Control Program, through a combination of academic, clinical, and game-simulation processes, seeks to provide an understanding of existing and pending problems, needs, means, and opportunities for solution with respect to this developing area of national concern.

PATENT LAW PROGRAM

Director Irving Kayton

The Patent Law Program is designed for students in the J.D. and Post-J.D. degree programs whose intentions are to specialize in the practice of patent law. During the past eight years an organized program has been developed to offer as complete and as integrated a collection of courses in patent law as possible. The course offerings in patent law now total 17 semester hours, far more than any other law school in the United States. In addition, courses in trademark and copyright law are also available (see the "Patent and Trade Regulation Law" area of specialization in the "Advanced Courses" section of this bulletin for a complete list and detailed description of the patent law courses offered). The object of the Patent Law Program is to provide the student with a concentration in patent law at a level of specialization and maturity which will enable advancement more rapidly in this field.

THE GEORGE WASHINGTON LAW ASSOCIATION

Director of Law Alumni Relations Clifford A. Dougherty, J.D.(W.H.) 19

THE GEORGE WASHINGTON LAW ASSOCIATION was founded in 1912 and has be affiliated with the General Alumni Association since 1926. Its purpose stated in the constitution are to promote high standards of legal education keep the alumni of the school in close touch with one another, especially w members of their own classes, to gather and publish at intervals informat to the whereabouts and activities of these alumni, and to further the inter of the school.

Eligible members are those who have matriculated in the school or Nationa University and have left in good standing, and any member or former mem of the faculty of the school. Active members are those eligible members are current contributors to the Law Annual Support Program of the Univer and life members of the George Washington Law Association.

The Association plans publication periodically of the Law Alumni Directo Law alumni are urged to keep the Alumni Office informed of their whe abouts so that directory information can be kept up to date.

The Law Alumni Office is in the University Library, 2130 H Street, N.W Washington, D.C. 20052.

OFFICERS FOR 1978-79

President.—Sheldon S. Cohen, J.D. 1962; Washington, D.C.
Vice President.—Betty Ann Thompson, B.A. 1946, LL.B. 1948; Arlington, Va.
Secretary.— Fred H. Daly, J.D. 1966; Washington, D.C.
Treasurer.—Marshall C. Gardner, B.S. 1943; J.D. 1955; Bowie, Md.
Board of Directors:
Joanne F. Alper, J.D. 1975; Falls Church, Va.
David F. Bantleon, J.D. 1971; Washington, D.C.
Jerome A. Barron, LL.M. 1960; Washington, D.C.
Robert C. Bennett, Jr., LL.B. 1965; Houston, Texas
Joseph L. Brand, J.D. 1963; Washington, D.C.
Richard F. Broz, J.D. 1953; Seattle, Wash.
Carol Elder Bruce, B.A. 1971, J.D. 1974, Arlington, Va.
William E. Casselman II, J.D. 1968; Alexandria, Va.
M. Michael Cramer, J.D. 1958; Washington, D.C.
Sam S. Crutchfield, Jr., B.A. 1960, J.D. 1963, Washington, D.C.
Frankie Sue Del Papa, J.D. 1974; Washington, D.C.
Allen T. Eaton, J.D. 1970; Washington, D.C.
Daniel R. Efroymson, J.D. 1972; Indianapolis, Ind.
M. Byron Fisher, J.D. 1964; Salt Lake City, Utah
Albert Ginsberg, J.D. 1950; Silver Spring, Md.
Edwin A. Heisler, J.D. 1965; Portland, Me.
Ruslyn S. Hill, J.D. 1975; Washington, D.C.

Joseph G. Hitselberger, LL.B. 1957; Arlington, Va.
Neil B. Kabatchnick, J.D. 1954; Silver Spring, Md.
Alan Kay, B.A. 1957, J.D. 1959; Washington, D.C.
Robert D. Krumme, J.D. 1964; New York, N.Y.
Jacob S. Levin, J.D. 1949; Upper Marlboro, Md.
Charles T. Mannett, J.D. 1962; Los Angeles, Calif.
Robert C. Miller, J.D. 1966; Arlington, Va.
Carl A. Modecki, LL.B. 1967; Boston, Mass.
Donald A. Rowe, LL.B. 1965; Cleveland, Ohio
Fred S. Souk, J.D. 1975; Vienna, Va.
Earl R. Stanley, J.D. 1949, LL.M. 1950; Washington, D.C.
Jacob A. Stein, LL.B. 1948; Washington, D.C.
John P. Sutton, J.D. 1963; San Francisco, Calif.
Kirby L. Turnage, Jr., J.D. 1964; Athens, Ga.
George H. Whitcomb, LL.B. 1966; Denver, Colo.
George F. Wilsey, Jr., J.D. 1958; St. Petersburg, Fla.
Joseph S. Wright, Jr., LL.B. 1963; Chicago, Ill.
Richard A. Ward, *ex officio*, B.A. 1961, J.D. (W.H.) 1965; Arlington, Va.



THE UNIVERSITY

HISTORY AND ORGANIZATION

THE GEORGE WASHINGTON UNIVERSITY had its beginning in 1821 as The Colu
bian College in the District of Columbia. The name of the institution w
changed in 1873 to Columbian University and in 1904 to The George Wa
ington University. The debt of the University to George Washington, whos
name it bears, is an intangible one.

George Washington, as President and as private citizen, had urgently insiste
upon the establishment of a National University in the Federal City. There h
hoped that, while being instructed in the arts and sciences, students from a
parts of the country would acquire the habits of good citizenship, throwing a
local prejudices and gaining at first hand a knowledge of the practice, as well
the theory, of republican government. To further the materialization of t
hopes, Washington left a bequest of fifty shares of The Potomac Company to
wards the endowment of a University to be established within the limits of t
District of Columbia, under the auspices of the General Government, if th
government should incline to extend a fostering hand towards it." The Con
gress never extended "a fostering hand." The Potomac Company passed out o
existence, and Washington's bequest became worthless.

Fully conscious of Washington's hopes, but motivated primarily by a gen
missionary urge and the need for a learned clergy, a group of dedicated min
isters and laymen sponsored a movement for the establishment of a college i
the District of Columbia. Inspired largely by the zeal and energy of the Rev
end Luther Rice, they raised funds for the purchase of a site and petitione
Congress for a charter. After much delay and amendment, Congress granted a
charter which was approved by President Monroe on February 9, 1821. To
safeguard the College's nonsectarian character it provided "that persons o
every religious denomination shall be capable of being elected Trustees, an
shall any person, either as President, Professor, Tutor or pupil, be refused ad
mittance into said College, or denied any of the privileges, immunities, or ad
vantages thereof, for or on account of his sentiments in matters of religion."

During the entire time when the institution was known as Columbian College
its activities were centered on College Hill, a tract of forty-six and a half acres
between the present Fourteenth and Fifteenth Streets extending north from Flo
ida Avenue to somewhat beyond Columbia Road. The Medical School was
located downtown. For the better part of the Columbian University period the
buildings of the University were situated along H Street between Thirteenth and
Fifteenth Streets.

During the last half century the University's present plant has been developed
in that section of the old First Ward familiarly known as "Foggy Bottom"
between Nineteenth and Twenty-fourth Streets, south of Pennsylvania Avenue.
The area contains several reminders of historic interest to the University. Pres
ident Monroe, who signed the Charter, lived at 2017 Eye Street. The first Pre
ident of the Board of Trustees, the Reverend Obadiah B. Brown, was for many
years the pastor of a church at Nineteenth and Eye Streets, and Washington

selected Twenty-third and E Streets as the site of the National University he had hoped to see established.

The University as it is now organized consists of Columbian College of Arts and Sciences (undergraduate); the Graduate School of Arts and Sciences; the professional schools, which include the National Law Center and the schools of Medicine and Health Sciences, Engineering and Applied Science, Education, Government and Business Administration, Public and International Affairs; the College of General Studies; the Division of University Students; the Summer Sessions; and the Division of Experimental Programs.

The George Washington University is privately endowed and is governed by a self-perpetuating Board of Trustees of which the president is an ex officio member.

ACADEMIC STATUS

The George Washington University is accredited by its regional accrediting agency, the Middle States Association of Colleges and Secondary Schools. The University is on the approved list of the American Association of University Women and is a member of the College Entrance Examination Board.

LOCATION

The University is in downtown Washington, between Pennsylvania Avenue and 19th, F, and 24th Streets, N.W. In immediately adjacent areas are the White House, the World Bank, the International Communication Agency, the Corcoran Gallery of Art, the Department of State, the Department of the Interior, the General Services Administration, the National Academy of Sciences, and the Kennedy Center for the Performing Arts.

The Board of Trustees

E.K. Morris, LL.D., D.P.S., *Chairman Emeritus*
Charles E. Phillips, LL.B., LL.M., *Chairman Emeritus*

Glen A. Wilkinson, B.S., J.D., *Chairman*
Everett H. Bellows, M.A., *Vice Chairman*
James M. Mitchell, M.A., *Secretary*
Thaddeus A. Lindner, B.A. in Govt., *Assistant Secretary*

George M. Bunker, B.S.
Mortimer M. Caplin, B.S., LL.B., J.S.D., LL.D.
*Lyn Henderson Clark, B.A.
Henry C. Clausen, J.D.
Jacqueline Cochran, L.H.D., LL.D., Sc.D.
Donald C. Cook, B.A., M.B.A., J.D., LL.M., L.H.D., LL.D.
L. Stanley Crane, B.S.
*Joseph B. Danzansky, B.A., J.D.

* Alumni trustee.

Nancy B. Dudley, B.A. in Govt.
John B. Duncan, B.A., LL.B., LL.D.
Lloyd H. Elliott, M.A., Ed.D., LL.D., *President of the University*, ex officio
Morton I. Funger, B.A.
Katharine Graham, B.A.
Edwin K. Hoffman, B.S.
Joseph D. Hughes, B.S., J.D., LL.M., LL.D.
L.A. Jennings
David M. Kennedy, LL.B., M.A., LL.D.
Melvin R. Laird, L.H.D., LL.D., D.Pol.S.
*Sidney A. Levine, B.A., M.D.
Franklin J. Lunding, LL.B., LL.D.
Jeremiah Milbank, B.A., M.B.A.
Thornton W. Owen, B.S. in C.E., B.A.
Flaxie M. Pinkett, B.A.
*Abe Pollin, B.A. in Govt.
S. Dillon Ripley II, Ph.D., L.H.D., Sc.D.
Orville F. Rush, J.D., LL.D.
John T. Sapienza, B.A., LL.B.
Carleton D. Smith
Douglas R. Smith, B.S.C.
Robert H. Smith, B.A.
Carleton M. Stewart, M.B.A.
Mark Sullivan, Jr., B.A.
John W. Thompson, Jr., B.A.
Robert L. Tull, B.A.
William G. White, B.S. in C.E.
Stephen R. Woodzell, B.S. in E.E.
James O. Wright, B.S., J.D.
*Joseph S. Wright, LL.B., LL.D.

HONORARY TRUSTEES

Jacob Burns, LL.B., LL.D.
George A. Butler, LL.B.
Harry F. Duncan
Newell W. Ellison, B.A., LL.B., LL.D.
Melville B. Grosvenor, B.S., Sc.D., LL.D.
Brooks Hays, B.A., J.D., LL.D., L.H.D., D.C.L., D.D., HH.D.
Joseph H. Hirshhorn
E.K. Morris, LL.D., D.P.S.
Godfrey L. Munter, B.A., LL.B., LL.D.
Charles E. Phillips, LL.B., LL.M.
Charles E. Smith
John J. Wilson, LL.B., LL.D.
Watson W. Wise, Ph.B., Litt.D.

* Alumni Trustee

Officers of Administration

THE UNIVERSITY

Lloyd Hartman Elliott, M.A., Ed.D., LL.D., *President*
Harold Frederick Bright, Ph.D., *Provost and Vice President for Academic Affairs*
Seymour Alpert, B.A., M.D., *Vice President for Development*
Charles Edward Diehl, B.Arch.Engr., B.C.E., M.B.A., *Vice President and Treasurer*
William David Johnson, B.S., *Director of Planning and Budgeting*
Ronald Paul Kaufman, B.S., M.D., *Vice President for Medical Affairs*
Carl James Lange, Ph.D., *Vice President for Administration and Research*
Louis Harkey Mayo, B.S., J.S.D., *Vice President for Policy Studies and Special Projects*
Frederick Justin Naramore, B.S., C.P.A., *Comptroller*
William Parkhurst Smith, Jr., B.A., M.B.A., M.A. in Ed., *Vice President for Student Affairs*
Robert Gebhardtsbauer, B.A., M.A., *Registrar*
Joseph Young Ruth, B.A., *Director of Admissions*

THE NATIONAL LAW CENTER

Jerome Aure Barron, B.A., LL.B., LL.M., *Dean of the National Law Center*
Edward Andrew Potts, B.A., LL.B., *Associate Dean of the National Law Center for Graduate Studies, Research, and Projects*
Clifford Alonzo Dougherty, B.S., J.D., *Director of Law Alumni Relations*
Audrey Dee Free, B.A., *Director of Student Assistance*
Lynn M. Hiner, B.A., *Director of Placement*
Evelyn Porter, *Budget Officer and Director of Services*
Robert V. Stanek, B.A., J.D., *Assistant Dean, Director of Admissions (J.D. Program)*

The Law Library

Hugh Yancey Bernard, Jr., B.A., B.S. in L.S., J.D., *Librarian*
Robert Gordon Bidwell, B.S., LL.B., M.S. in L.S., *Associate Librarian for Management and Planning*
Malinda Carpenter Lee, B.A., M.A., M.S. in L.S., *Associate Librarian for Technical Services*
James Stephen Heller, B.A., M.L.S., J.D., *Associate Librarian for Reader Services*
Maurine Olsen Hemingway, Certificate in Cataloging and Classification, *Librarian (Senior Cataloger)*
Kathleen Theresa Larson, B.A., M.L.S., *Librarian (Reference, Government Documents)*
Kristen Nova Lochrie, B.A., M.L.S., *Librarian (Reference, Circulation, Multi-Media Services)*



THE NATIONAL LAW CENTER

Faculty and Staff of Instruction*

EMERITI

Oswald Symister Colclough, *Professor Emeritus of Law; Dean of Faculties Emeritus; Director Emeritus of the Patent, Trademark, and Copyright Research Institute*
B.S. 1920, U.S. Naval Academy; LL.B. 1935, Sc.D. 1961, George Washington University; LL.D. 1946, Muhlenberg College; LL.D. 1958, Dickinson School of Law

William Thomas Fryer, *Professor Emeritus of Law*
B.A. 1922, LL.B. 1924, George Washington University; J.D. 1925, Yale University

Harold Paul Green, *Professor Emeritus of Law*
B.A. 1942, J.D. 1948, University of Chicago

Louis James Harris, *Professor Emeritus of Law*
B.A. 1943, Cornell University; LL.B. 1939, S.J.D. 1942, Brooklyn Law School; LL.M. 1948, George Washington University

W. Wallace Kirkpatrick, *Professor Emeritus of Law*
B.A. 1934, LL.B. 1938, Harvard University

Robert Kramer, *Professor Emeritus of Law; Dean Emeritus of the National Law Center*
B.A. 1935, LL.B. 1938, Harvard University

Arthur Selwyn Miller, *Professor Emeritus of Law*
B.A. 1938, Willamette University; LL.B. 1949, Stanford University; J.S.D. 1959, Yale University

James Oliver Murdock, *Professor Emeritus of Law*
Ph.B. 1916, University of Chicago; LL.B. 1924, Harvard University

Charles Bernard Nutting, *Professor Emeritus of Law*
B.A. 1927, J.D. 1930, University of Iowa; LL.M. 1932, S.J.D. 1933, Harvard University; LL.D. 1957, University of Pittsburgh; Litt.D. 1957, Geneva College; L.H.D. 1957, Seton Hill College; LL.D. 1960, Dickinson School of Law

ACTIVE

†Jeffrey Marshall Albert, *Professor of Law*
B.A. 1956, Princeton University; LL.B. 1959, Harvard University; LL.M. 1962, New York University

Oscar Altshuler, *Professorial Lecturer in Law*
LL.B. 1951, George Washington University

John Banzhaf III, *Professor of Law*
B.S. in E.E. 1962, Massachusetts Institute of Technology; J.D. 1965, Columbia University

Jerome Aure Barron, *Professor of Law; Dean of the National Law Center*
B.A. 1955, Tufts University; LL.B. 1958, Yale University; LL.M. 1960, George Washington University

Robert Howard Becker, *Professorial Lecturer in Law*
B.S.S. 1951, City University of New York, City College; J.D. 1954, Yale University

---

* Professors, Associate Professors, Assistant Professors, and the Librarian of the Law Library constitute the Faculty of the National Law Center. The President of the University, the Vice President for Academic Affairs, the Registrar of the University, the Director of Admissions of the University, and the University Librarian are *ex officio* members of the faculty.

† On sabbatical leave, fall semester 1979

Alan Berkeley, *Professorial Lecturer in Law*
B.S. 1964, Cornell University; J.D. 1967, Georgetown University

Hugh Yancey Bernard, Jr., *Professor of Law; Librarian of the Law Library*
B.A. 1941, University of Georgia; B.S. in L.S. 1947, Columbia University; J.D. 1961, George Washington University

John Bodner, Jr., *Professorial Lecturer in Law*
J.D. 1953, Northwestern University; M.L.A. 1969, Johns Hopkins University

Marjorie Harriette Borders, *Adjunct Instructor in Law*
B.S. 1968, J.D. 1972, Howard University

David H. Brockway, *Professorial Lecturer in Law*
B.A. 1968, Cornell University; J.D. 1971, Harvard University

James Milton Brown, *Professor of Law; Director of the Land Use Management and Control Program*
B.A. 1943, University of Illinois; J.D. 1963, University of Florida

Brian Garrett Brunsvold, *Professorial Lecturer in Law*
B.S. 1960, Iowa State University of Science and Technology; J.D. 1967, George Washington University

Gerald Martin Caplan, *Professor of Law*
B.A. 1959, M.A. 1960, J.D. 1963, Northwestern University

Herbert Chabot, *Professorial Lecturer in Law*
B.A. 1952, City University of New York, City College; LL.B. 1957, Columbia University; LL.M. 1964, Georgetown University

James Philip Chandler, *Professor of Law*
B.A. 1963, University of California, Berkeley; J.D. 1970, University of California, Boalt Hall; LL.M. 1971, Harvard University

Robert Howard Chanin, *Professorial Lecturer in Law*
B.A. 1956, City University of New York, Brooklyn College; LL.B. 1959, Yale University; M.A. 1961, Columbia University

Mary M. Cheh, *Visiting Associate Professor of Law*
B.A. 1972, Rutgers—The State University (Douglass College); J.D. 1975, Rutgers—The State University; LL.M. 1977, Harvard University

John Cibinic, Jr., *Professor of Law*
B.A. 1956, University of Pittsburgh; J.D. 1960, George Washington University

Louis Richard Cohen, *Professorial Lecturer in Law*
B.A. 1962, LL.B. 1966, Harvard University

Sheldon Stanley Cohen, *Professorial Lecturer in Law*
B.A. in Govt. 1950, J.D. 1952, George Washington University

*Thomas Francis Courtless, Jr., *Professor of Law and of Sociology; Director of the Institute of Law, Psychiatry, and Criminology*
B.A. 1955, Pennsylvania State University; M.A. 1960, Ph.D. 1966, University of Maryland

Clair Allan Cripe, *Professorial Lecturer in Law*
B.A. 1954, Oberlin College; LL.B. 1957, Harvard University

Richard Dickson Cudahy, *Professorial Lecturer in Law*
B.S. 1949, U.S. Military Academy; J.D. 1955, Yale University

Bernard Cushman, *Professorial Lecturer in Law*
B.A. 1934, Dartmouth College; LL.B. 1939, Harvard University

Warren Davis, *Associate Professorial Lecturer in Law*
B.S.F.S. 1969, J.D. 1974, Georgetown University

Georges Rene Delaume, *Professorial Lecturer in Law*
Diplôme de Docteur en Droit 1947, University of Paris; M.Comp.L. 1953, George Washington University

Paul Gerald Dembling, *Professorial Lecturer in Law*
B.A. 1940, M.A. 1942, Rutgers—The State University, J.D. 1951, George Washington University

Charles Thomas Dienes, *Visiting Professor of Law*
B.S. 1961, Loyola University of Chicago; J.D. 1964, Ph.D. 1968, Northwestern University

* On sabbatical leave, fall semester 1979

Murray Drabkin, *Professorial Lecturer in Law*
B.A. 1950, Hamilton College; LL.B. 1953, Harvard University

George B. Driesen, *Professorial Lecturer in Law*
B.A. 1954, Harvard University; LL.B. 1961, Yale University

Donald Robert Dunner, *Professorial Lecturer in Law*
B.S. in Ch.E. 1953, Purdue University; J.D. 1958, Georgetown University

William H. DuRoss III, *Professorial Lecturer in Law*
B.A. 1965, Yale University; J.D. 1968; LL.M. 1971, George Washington University

Howard Phillip Fink, *Visiting Professor of Law*
B.S. 1955, Cornell University; LL.B. 1958, Yale University

Jerry Fischer, *Adjunct Instructor in Law*
B.A. 1972, College of William and Mary; J.D. 1978, Catholic University of America

Salvatore Francis Fiscina, *Professorial Lecturer in Law*
B.A. 1963, Harvard University; M.D. 1967, University of Rochester; J.D. 1973, George Washington University

Eugene A. Fisher, *Professorial Lecturer in Law*
B.S. 1965, University of Maryland; J.D. 1969, Georgetown University

Michael Richard Flyer, *Professorial Lecturer in Law*
B.A. 1959, LL.B. 1962, University of Michigan

Mark Foster, *Professorial Lecturer in Law*
B.A. 1965, Yale University; J.D. 1971, Harvard University

Richard Louis Fruchterman, Jr., *Professorial Lecturer in Law*
B.S. 1951, J.D. 1954, Georgetown University

Gilbert Jerome Ginsburg, *Professor of Law; Director of the Government Contracts Program*
B.A. 1954, B.A. in Law 1955, J.D. 1957, University of Chicago

Jackson Reid Hambrick, *Professor of Law*
B.A. 1938, Wofford College; LL.B. 1942, Duke University

Gerald Stuart Hartman, *Professorial Lecturer in Law*
B.A. 1966, M.B.A. 1968, Columbia University; J.D. 1972, George Washington University

Ann Marie Hay, *Adjunct Instructor in Law*
B.A. 1963, University of California, Berkeley; B.S. 1968, University of Minnesota; J.D. 1978, Georgetown University

Murdock Head, *Airlie Professor of Medical and Public Affairs*
D.D.S. 1947, University of Louisville; M.D. 1953, University of Vermont; J.D. 1958, George Washington University

William Norman Hedeman, Jr., *Professorial Lecturer in Law*
B.A. 1964, Gettysburg College; J.D. 1968, University of Maryland; LL.M. 1972, George Washington University

John Roderick Heller III, *Professorial Lecturer in Law*
B.A. 1959, Princeton University; M.A. 1960, LL.B. 1963, Harvard University

Paul Joseph Henon, *Professorial Lecturer in Law*
B.E.E. 1960, Georgia Institute of Technology; J.D. 1967, American University

Harold Lester Hirsh, *Professorial Lecturer in Law*
M.D. 1942, Georgetown University; J.D. 1972, American University

Bruce Richard Hopkins, *Professorial Lecturer in Law*
B.A. 1964, University of Michigan; J.D. 1967; LL.M. 1971, George Washington University

Oliver Austin Houck, *Professorial Lecturer in Law*
B.A. 1960, Harvard University; J.D. 1967, Georgetown University

Tao-tai Hsia, *Professorial Lecturer in Law*
LL.B. 1945, National Cheng-chi University, China; LL.M. 1950, J.S.D. 1952, Yale University

Radwan Jabri, *Professorial Lecturer in Law*
LL.B. 1965, University of Aleppo; M.C.L. 1968, University of Miami; LL.M. 1970, S.J.D. 1972, George Washington University

John Wingfield Jackson, *Adjunct Professor of Law*
B.S. 1928, University of Pennsylvania; J.D. 1932, George Washington University

Calvin Patrick Johnson, *Professorial Lecturer in Law*
B.A. 1968, University of Santa Clara; J.D. 1971, Stanford University

Charles Richard Johnston, Jr., *Professorial Lecturer in Law*
B.A. 1970, Ohio Wesleyan University; J.D. 1973, California Western School of Law

Alan Hirsh Kaplan, *Professorial Lecturer in Law*
B.A. 1951, LL.M. 1957, New York University; LL.B. 1954, Harvard University

*Irving Kayton, *Professor of Law; Director of the Patent Law Program*
B.A. 1951, Cornell University; LL.B. 1957, New York University; LL.M. 1964, J.S.D. 196[illegible] Columbia University

David Israel Kempler, *Visiting Professor of Law*
B.S. 1963, University of Pennsylvania; J.D. 1966, University of Connecticut; LL.M. [illegible] Georgetown University

John Alexander Kendrick, *Professorial Lecturer in Law*
B.A. 1942, LL.B. 1943, George Washington University

Maurice Klitzman, *Professorial Lecturer in Law*
B.S. in M.E. 1948, Purdue University; J.D. 1951, George Washington University

Jason David Kogan, *Associate Professorial Lecturer in Law*
B.A. 1966, Pennsylvania State University; J.D. 1969, George Washington University

Henry West Leeds, *Professorial Lecturer in Law*
B.S. in Econ. 1953, University of Pennsylvania; J.D. 1956, University of Michigan

Jack Lewis, *Professorial Lecturer in Law*
B.A. 1965, Brown University; J.D. 1969, Cornell University

Robinwyn Dietrich Lewis, *Adjunct Instructor in Law*
B.A. 1965, Swarthmore College; M.A. 1971, University of Pennsylvania; J.D. 1974, Geo[illegible] Washington University

Jerome Bernard Libin, *Professorial Lecturer in Law*
B.S. 1956, Northwestern University; J.D. 1959, University of Michigan

William M. Lieber, *Professorial Lecturer in Law*
B.S. 1961, University of Illinois; J.D. 1964, University of Chicago

Barry London, *Lecturer in Law*
B.S. 1968, J.D. 1971, University of Pennsylvania

David Crittenden Lowther, *Professor of Law*
B.A. 1948, Harvard University; LL.B. 1951, University of Virginia

Thomas J. Madden, *Professorial Lecturer in Law*
B.E.E. 1964, Villanova University; J.D. 1968, Catholic University of America

William Thomas Mallison, *Professor of Law; Director of the International Law Program*
B.A. 1940, University of Washington; LL.B. 1948, Vanderbilt University; J.S.D. 1967, Yale University

Martin Guilbert Malsch, *Professorial Lecturer in Law*
B.S. 1964, College of the Holy Cross; J.D. 1968, University of Connecticut

Mark Anthony Mancini, *Associate Professorial Lecturer in Law*
B.A. 1970, University of Pennsylvania; J.D. 1973, Temple University

Arthur Francis Mathews, *Professorial Lecturer in Law*
B.A. 1959, Union College, New York; J.D. 1962, Union University, New York, LL.M. 1966, Georgetown University

Louis Harkey Mayo, *Professor of Law; Vice President for Policy Studies and Special Projects*
B.S. 1940, U.S. Naval Academy; LL.B. 1949, University of Virginia; J.S.D. 1953, Yale University

Jerry J. McCoy, *Professorial Lecturer in Law*
B.S. 1963, West Virginia University; LL.B. 1966, Duke University; LL.M. 1967, New York University

* On leave of absence, spring semester 1980.

James Franklin McMullin, *Professorial Lecturer in Law*
B.A. 1963, Iona College; J.D. 1966, Catholic University of America

Kenneth Everett Melson, *Associate Professorial Lecturer in Law*
B.A. 1970, Denison University; J.D. 1973, George Washington University

Leroy Sorenson Merrifield, *Lobingier Professor of Jurisprudence and Comparative Law*
B.A. 1938, LL.B. 1941, University of Minnesota; M.P.A. 1942, S.J.D. 1956, Harvard University

Frederick Leon Miller, Jr., *Professorial Lecturer in Law*
B.A. 1965, Yale University; J.D. 1968, Georgetown University; LL.M. 1975, George Washington University

Milton Mitchell, *Professorial Lecturer in Law*
J.D. 1942, George Washington University

Waldo Hawthorne Moore, *Professorial Lecturer in Law*
J.D. 1949, M.P.L. 1953, George Washington University

Ralph Anthony Muoio, *Professorial Lecturer in Law*
B.S. 1955, University of Pennsylvania; J.D. 1961, Harvard University

Jerome Christian Muys, *Professorial Lecturer in Law*
B.A. 1954, Princeton University; LL.B. 1957, Stanford University

Ralph Clarke Nash, Jr., *Professor of Law*
B.A. 1953, Princeton University; J.D. 1957, George Washington University

Stephen Alan Nauheim, *Professorial Lecturer in Law*
B.S. 1964, University of North Carolina; J.D. 1967, Georgetown University; LL.M. 1970, George Washington University

David Niblack, *Adjunct Instructor in Law*
B.S. 1957, LL.B. 1964, Georgetown University

Nicholas Stephen Nunzio, *Professorial Lecturer in Law*
B.A. in Govt. 1957, LL.B. 1960, George Washington University

Lester Nurick, *Professorial Lecturer in Law*
B.S.S. 1934, City University of New York, City College; LL.B. 1937, Brooklyn Law School

Dennis Michael O'Dea, *Visiting Associate Professor of Law*
B.A. 1968, University of Notre Dame; J.D. 1972, University of Michigan

Saul Chesterfield Oppenheim, *Distinguished Scholar and Adviser in the National Law Center*
B.A. 1918, M.A. 1920, Columbia University; J.D. 1926, S.J.D. 1929, University of Michigan; LL.D. 1973, George Washington University

Robert Eugene Park, *Professor of Law*
B.S. 1952, B.A. 1957, J.D. 1961, University of Florida; LL.M. 1965, Yale University

David Andreas Peterson, *Associate Professorial Lecturer in Law*
B.A. 1964, Occidental College; J.D. 1967, M.B.A. 1968, George Washington University; M.P.A. 1974, Harvard University; Ph.D. 1975, Johns Hopkins University

Harvey Pitt, *Professorial Lecturer in Law*
B.A. 1965, City University of New York, City College; J.D. 1968, St. Johns University, New York

Maximilian Pock, *Professor of Law*
J.D. 1958, University of Iowa; S.J.D. 1962, University of Michigan

Edward Andrew Potts, *Professor of Law; Associate Dean of the National Law Center, for Graduate Studies, Research, and Projects*
B.A. 1949, University of Michigan; LL.B. 1952, George Washington University

Bernard Ramundo, *Professorial Lecturer in Law*
B.A. 1947, City University of New York, City College; LL.B. 1949, M.A. 1957, Columbia University; Ph.D. 1966, American University

Sara B. Rearden, *Associate Professorial Lecturer in Law*
B.A. 1964, North Carolina Agricultural and Technical State University; J.D. 1969, Howard University

Arnold Winfred Reitze, *Professor of Law; Director of the Environmental Law Program*
B.A. 1960, Fairleigh Dickinson University; J.D. 1962, Rutgers—The State University (Newark)

David Robinson, Jr., *Professor of Law*
B.A. 1950, Reed College; J.D. 1956, Columbia University; LL.M. 1965, Harvard University

Susan Deller Ross, *Visiting Professor of Law*
B.A. 1964, Knox College; J.D. 1970, New York University

Donald Phillip Rothschild, *Professor of Law*
B.A. 1950, University of Michigan; J.D. 1965, University of Toledo; LL.M. 1966, Harvard University

Joseph Michael Francis Ryan, Jr., *Professorial Lecturer in Law*
B.A. 1943, St. Joseph's College, Pennsylvania; LL.B. 1950, LL.M. 1952, Georgetown University; Judge, District of Columbia Court of General Sessions

Michael Sanders, *Professorial Lecturer in Law*
B.S. 1960, LL.B. 1964, New York University; LL.M. 1967, Georgetown University

John Edward Scheuermann, *Professorial Lecturer in Law*
B.A. 1966, St. Michael's College; J.D. 1973, Georgetown University

Lewis Aaron Schiller, *Professor of Law*
B.A. 1950, LL.B. 1952, University of Texas at Austin; M.A. 1958, Tufts University

Frank Schnidman, *Professorial Lecturer in Law*
B.S. 1970, Springfield College; J.D. 1973, Union University; LL.M. 1974, George Washington University

Richard L. Schwaab, *Associate Professorial Lecturer in Law*
B.S. 1967, University of Wisconsin; J.D. 1971, George Washington University

Teresa Moran Schwartz, *Professor of Law*
B.A. 1965, Stanford University; J.D. 1971, George Washington University

Lawrence W. Secrest III, *Professorial Lecturer in Law*
B.A. 1965, American University; J.D. 1968, George Washington University

Lester Barry Seidel, *Professorial Lecturer in Law*
B.A. 1966, University of Michigan; J.D. 1969, George Washington University; LL.M. 1970, University of Missouri—Columbia

David Earl Seidelson, *Professor of Law*
B.A. 1951, LL.B. 1956, University of Pittsburgh

David James Sharpe, *Professor of Law and of Medical and Public Affairs*
B.A. 1950, University of North Carolina at Chapel Hill; LL.B. 1955, S.J.D. 1969, Harvard University

John Silard, *Professorial Lecturer in Law*
B.A. 1949, LL.B. 1952, Columbia University

Andrew Warren Singer, *Professorial Lecturer in Law*
B.S. in Econ. 1963, University of Pennsylvania; LL.B. 1966, Harvard University

Eric Scott Sirulnik, *Professor of Law; Director of Clinical Programs*
B.A. 1965, Franklin and Marshall College; J.D. 1968, Boston University; LL.M. 1970, George Washington University

Dudley Graham Skinker, *Clerk of the Trial Practice Court*
LL.B. 1940, George Washington University

Lewis David Solomon, *Professor of Law*
B.A. 1963, Cornell University; J.D. 1966, Yale University

Theodore Irwin Sonde, *Professorial Lecturer in Law*
B.A. 1961, City University of New York, City College; LL.B. 1964, New York University; LL.M. 1967, Georgetown University

James Edward Starrs, *Professor of Law*
B.A., LL.B. 1958, St. John's University, New York; LL.M. 1959, New York University

Peter Richard Steenland, Jr., *Professorial Lecturer in Law*
B.A. 1967, J.D. 1970, George Washington University

Alexander Louis Stevas, *Professorial Lecturer in Law*
B.A. 1949, LL.B. 1951, George Washington University

Russell Bennett Stevenson, Jr., *Professor of Law*
B.M.E. 1964, Cornell University; J.D. 1969, Harvard University

Joan H. Strand, *Adjunct Instructor in Law*
B.A. 1972, J.D. 1975, George Washington University

William D. Strathman, *Professorial Lecturer in Law*
B.A. 1960, Pomona College; M.D. 1964, Harvard University

Jerome Kenneth Tankel, *Professorial Lecturer in Law*
B.A. 1957, University of Illinois; J.D. 1963, Harvard University; LL.M. 1968, George Washington University

Richard E. Timbie, *Professorial Lecturer in Law*
B.S. 1968, J.D. 1971, Stanford University

Robert Max Tobias, *Professorial Lecturer in Law*
B.A. 1965, M.B.A. 1967, University of Michigan; J.D. 1969, George Washington University

Stefan Franklin Tucker, *Professorial Lecturer in Law*
B.B.A. 1960, J.D. 1963, University of Michigan

James Steven Turner, *Adjunct Instructor in Law*
B.A. 1962, J.D. 1969, Ohio State University

Arvin E. Upton, *Professorial Lecturer in Law*
B.A. 1933, Western Kentucky University; J.D. 1940, Harvard University

David Benson Weaver, *Professor of Law*
B.A. 1943, Ohio Wesleyan University; J.D. 1948, Case Western Reserve University

Frederick Weisberg, *Professorial Lecturer in Law*
B.A. 1965, Cornell University; J.D. 1968, University of Michigan

Glen Earl Weston, *Oppenheim Professor of Antitrust and Trade Regulation Law*
B.S. 1943, University of Maryland; J.D. 1948, George Washington University

John Leslie White, *Professorial Lecturer in Law*
B.A. 1948, M.S. 1949, Kalamazoo College; J.D. 1958, George Washington University

Richard Carlton Wills, *Adjunct Instructor in Law*
B.S. 1972, J.D. 1975, Villanova University

Michael F. Zeldin, *Adjunct Instructor in Law*
B.A. 1973, State University of New York at Binghamton; J.D. 1976, George Washington University

Elyce Zenoff, *Professor of Law*
B.S. 1951, University of Wisconsin; LL.B. 1954, Northwestern University

Murray Zweben, *Professorial Lecturer in Law*
B.S. 1952, M.S. 1953, State University of New York at Albany; LL.B. 1959, George Washington University

* On sabbatical leave, academic year 1979–80

SUMMARY OF REGISTRATION, FALL SEMESTER 197

	1st year	2nd year	3rd year	4th year	Graduate	O
Day	325	319	314	.....	37	
Evening	117	94	98	102	248	

Total: 1,661

ANNUAL ISSUES OF UNIVERSITY BULLETINS

Requests for the following publications must include your zip code and should be addressed to the office indicated, George Washington University, Washington, D.C. 20052.

COLLEGE OF GENERAL STUDIES, Dean of the College

NATIONAL LAW CENTER, Admissions Office, National Law Center

SCHOOL OF ENGINEERING AND APPLIED SCIENCE, Dean of the School

UNDERGRADUATE AND GRADUATE PROGRAMS (Arts and Sciences, Education and Human Development, Government and Business Administration, Public and International Affairs), Admissions Office

SCHOOL OF MEDICINE AND HEALTH SCIENCES, Admissions Office, School of Medicine and Health Sciences

SCHEDULE OF CLASSES: FALL (Preregistration Edition, Revised Edition) AND SPRING SEMESTERS, Registrar

SCHEDULE OF CLASSES, SUMMER SESSIONS, Dean of the Summer Sessions

INDEX

Academic dishonesty, 42
Academic status of the University, 85
Academic work load, 37
Accident insurance, 46
Accreditation, University, 85
Administrative law—economic regulation:
  Courses, 52, 56, 58-60
  LL.M. specialization, 18
Administration, officers of, 87
Admission:
  Application, 28-29
  Continuing legal education students, 25
  J.D. program, 11, 28-29
  Master's and doctoral programs, 28
  Students from foreign institutions, 22-24, 28-29
  Test, law school, 11-12, 28
  Unclassified students, 25, 28-29
Advanced standing, J.D. degree, 12
Alumni association, 82-83
Alumni office, 82
Appellate Case Club, Van Vleck, 17
Assistantships, research, 34-35
Attendance, 38
Awards, 36-37
Bacon Hall, 9-10
Bar association, student, 17
Bar review course, 37
Beta Kappa Pi, 17
Black America law student association, 17
Board of Trustees, 85-86
Buildings of the National Law Center, 9-11
Calendar, 1979-80, 4-5
Case Club, Van Vleck Appellate, 17
Changes in program of studies, 38
Choice of paper or examination, 39
Civil rights research council, law students, 17
Class [illegible] entering, 1978, 12
[illegible] law program, 48
[illegible], Order of the, 15
Comparative law:
  [illegible]ses, 50, 72-74
  [illegible]der Center, 44
  [illegible] student, 44
  [illegible]rium of Universities of the Washington Metropolitan Area, Inc., 21
Continuing legal education, 25
Continuous enrollment, 42
Corporation law:
  Courses, 51-53, 60-61
  LL.M. specialization, 18
Course offerings, time of, 27, 48
Courses in other departments of the University, 21, 37
Courses, numbering of, 48
Courses of instruction, 49-79
  Advanced, 58-79
  For J.D. candidates:
    Elective, 50-58
    Required, 49-50
Credit hours, 48
Credit/no credit option, 39-40
Credit, summer school, 41
Curriculum, J.D., 13-14
Day classes, 27, 48
Day division, 13, 27
D.C. law students in court program, 54
Degree requirements:
  International students, 24-25
  J.D. program, 14-15
  LL.M. program, 19-20
  M.Comp.L. programs, 25
  S.J.D. program, 22
Delta Theta Phi, 17
Disabilities, office of services for students with, 47
Dishonesty, academic, 42
Dismissal of students, 43
Dissertation, S.J.D., 22
Doctor of Juridical Science, degree of, 21-22, 24
Emeriti faculty, 89
Employment, student, 46
English, test of, as a foreign language, 24
Entering classes, J.D. program, 12
Entrance requirements:
  J.D. program, 11-12, 24
  LL.M. program, 19, 24
  M.Comp.L. programs, 24
  S.J.D. program, 21-22, 24
Environmental Law:
  Courses, 69-70
  LL.M. specialization, 18
  Program, 80
Evening classes, 27, 48
Evening division, 14, 27

Examinations, 27, 39, 48
Research paper in lieu of, 39, 48
Take-home, 48
Exclusion and probation for poor scholarship, 40-41
Faculty, 89-95
Fees, 30-33
Food service rates, 45
Payment of, 31-32
Fellowships, 36
Financial aid, 34-36
Financial regulations, 30-33
Food service, 45
Fraternities, law, 17
George Washington Law Association, 82-83
George Washington Law Review, 15-16, 51
Government contracts program, 80
Government procurement law:
Courses, 62
LL.M. specialization, 18
Grades, 40
Graduate and Professional School Financial Aid Service, 34
Graduate courses in other departments, 21, 37
Graduation:
Application, 42
Fees, 30
Requirements, 42
Health service, student, 45-46
History of the National Law Center, 7-8
History of the University, 84-85
Honorary trustees, 86
Honors, 15, 21
Hours of instruction, 27, 48
Housing, 45
Insurance, health and accident, 46
International law:
Courses, 50-51, 72-74
LL.M. specialization, 18
Program, 81
Society, 17
International Law and Economics, Journal of, 16, 51
International students, degree programs for, 22-25
Jacob Burns Law Library, 10-11
Joint Juris Doctor/Master's degree program, 18
Journal of International Law and Economics, 16, 51
Juris Doctor program, 11-18
Labor Law:
Courses, 53, 62-64
LL.M. specialization, 18
Language test for foreign students, 24
Land use management and control:
Courses, 52, 68-69
LL.M. specialization, 18
Program, 81
Law and poverty:
Courses, 64-65
LL.M. specialization, 18
Law fraternities and sororities, 17
Law library, 10-11
Law, psychiatry, and criminology:
Courses, 65-67
LL.M. specialization, 18
Law Review, 15-16, 51
Law School Admission Test, 11, 28
Law School Data Assembly Service, 28
Law, science, and technology:
Courses, 67-68
LL.M. specialization, 18
Law students civil rights research council, 17
Legal aid bureau, 54-55
Legal education, continuing, 25
Library, 10-11
Officers, 87
Loan funds, 35
Lost and found, 44
Marvin, Cloyd Heck, Center, 45
Master of Comparative Law, degree of, 22-25
Master of Laws, degree of, 18-21, 24
Master's/Juris Doctor degree, joint program, 18
Master's thesis, 19-20
Moot court competition, 17
Movimiento Legal Latino, 17
Numbering of courses, 48
Objectives of the National Law Center, 9
Officers of administration, 87
Order of the Coif, 15
Organizations, Law Center, 17-18
Patent and trade regulation law:
Courses, 52, 55, 71-72
LL.M. specialization, 18
Patent law association, student, 17
Patent law program, 81
Phi Alpha Delta, 17
Phi Delta Phi, 17
Placement service, 46
Poverty, law and:
Courses, 64-65
LL.M. specialization, 18

Pre-Law Handbook, 28
Prepaid and deferred payment plan, 32
Prizes, 36-37
Probation, 40-41
Problem assignments, 48
Profile of entering class, 1978, 12
Programs, right to change, 43
Projected tuition and fee increases, 31
Property responsibility, 44
Publications, 15-16
Readmission, 29
Refunds, 32-33
Registration, 29-30
Regulations, 37-44
  Financial, 30-33
Release of student information, policy on, 43
Research and instruction, special programs in, 80-81
Research assistantships, 34-35
Research paper, 39, 48
Residence requirements, 14-15, 19, 22, 25
Rules, right to change, 43
Scholarship, 14-15, 19, 25
Scholarships, 34-36
Societies, law, 17
Special programs in research and instruction, 80-81
Staff of instruction, 89-95
Stockton Hall, 9
Student bar association, 17
Student conduct, 44
Student employment, 46
Student enrollment, 27
Student health service, 45-46
Student information, release of, 43
Student services, 45-47
Students-in-court program, 54
Summary of registration, fall 1979, 96
Summer school credit, 41
Summer term, 27
Take-home examination, 48
Taxation:
  Courses, 53, 75-77
  LL.M. specialization, 18
Tests
  English as a foreign language, 24
  Law school admission, 11, 28
Thesis, Master's, 19-20
Time of course offerings, 27, 48
Transcripts of record, 23-24, 28, 31, 42
Transfer from day division to evening division, 37
Trial practice court, 57
Trustees, Board of, 85-86
Tuition
  Deposit, 12, 31
  Fees, 30
  Projected increases, 31
  Refund of, 32-33
Unclassified students, 25, 28-29
University, academic status of, 85
University center fee, 30
University computer center, 44
University—history and organization, 84-85
Urban legal studies:
  Courses, 64, 68, 76, 77-78
  LL.M. specialization, 18
Van Vleck Appellate Case Club, 17
Veterans benefits, 46-47
Withdrawals, 32-33
Women's rights committee, 18
Writing assignments, 48

COLLEGES AND SCHOOLS—DEGREE PROGRAMS

COLUMBIAN COLLEGE OF ARTS AND SCIENCES: Associate in Arts (A.A.), Associate in Arts in General Studies (A.A. in Gen.Std.), Associate in Science, Cartographic Science (A.S. in Cart.Sc.), Associate in Science in Geodesy (A.S. in Geod.), Bachelor of Arts (B.A.), Bachelor of General Studies (B.Gen.St.), Bachelor of Science (B.S.), Bachelor of Science in Cartographic Science (B.S. in Cart. Sc.), Bachelor of Science in Geodesy (B.S. in Geod.), and Bachelor of Science in Oceanography (B.S. in Ocea.)

GRADUATE SCHOOL OF ARTS AND SCIENCES: Master of Arts (M.A.), Master of Arts in Special Studies (M.A. in Sp Std.), Master of Fine Arts (M.F.A.), Master of Forensic Sciences (M.F.S.), Master of Music (Mus.M.), Master of Science (M.S.), Master of Science for Teachers (M.S. for Teachers), Master of Science in Forensic Science (M.S.F.S.), Master of Science in Special Studies (M.S. in Sp.Std.) and Doctor of Philosophy (Ph.D.)

SCHOOL OF MEDICINE AND HEALTH SCIENCES: Associate in Science (A.S.), Bachelor of Science (B.S.), Bachelor of Science in Health Science (B.S. in H.Sc.), and Doctor of Medicine (M.D.)

NATIONAL LAW CENTER: Juris Doctor (J.D.), Master of Laws (LL.M.), Master of Comparative Law (M.Comp.L.), Master of Comparative Law (American Practice) (M.Comp.L. (Am.Prac.)) and Doctor of Juridical Science (S.J.D.)

SCHOOL OF ENGINEERING AND APPLIED SCIENCE: Bachelor of Science (Civil Engineering) (B.S. (C.E.)), Bachelor of Science (Electrical Engineering) (B.S. (E.E.)), Bachelor of Science (Mechanical Engineering) (B.S. (M.E.)), Master of Engineering Administration (M.E.A.), Master of Science (M.S.), Engineer (Engr.), Applied Scientist (App.Sc.) and Doctor of Science (D.Sc.)

SCHOOL OF EDUCATION AND HUMAN DEVELOPMENT: Bachelor of Arts in Education (B.A. in Ed.), Bachelor of Science in Human Kinetics and Leisure Studies (B.S. in H.K.L.S.), Master of Arts in Education (M.A. in Ed.), Master of Arts in Teaching (M.A.T.), Education Specialist (Ed.S.) and Doctor of Education (Ed.D.)

SCHOOL OF GOVERNMENT AND BUSINESS ADMINISTRATION: Bachelor of Business Administration (B.B.A.), Bachelor of Science in Administration (B.S. in Adm.), Bachelor of Science in Health Care Administration (B.S. in H.C.A.), Master of Accounting (M.Acct.), Master of Arts in Health Care Administration (M.A. in H.C.A.), Master of Business Administration (M.B.A.), Master of Public Administration (M.P.A.), Master of Science in Administration (M.S. in Adm.), Master of Urban and Regional Planning (M. of Urb. and Reg. Plan.), Master's Graduate Certificate in Health Care Administration (Grad. Cert. in H.C.A.), Doctor of Business Administration (D.B.A.) and Doctor of Public Administration (D.P.A.)

SCHOOL OF PUBLIC AND INTERNATIONAL AFFAIRS: Bachelor of Arts (B.A.), Master of Arts (M.A.) and Master of Science in International Affairs (M.S.I.A.)





E GEORGE WASHINGTON UNIVERSITY BULLETIN
LXXVIII, No. 2, April, 1979

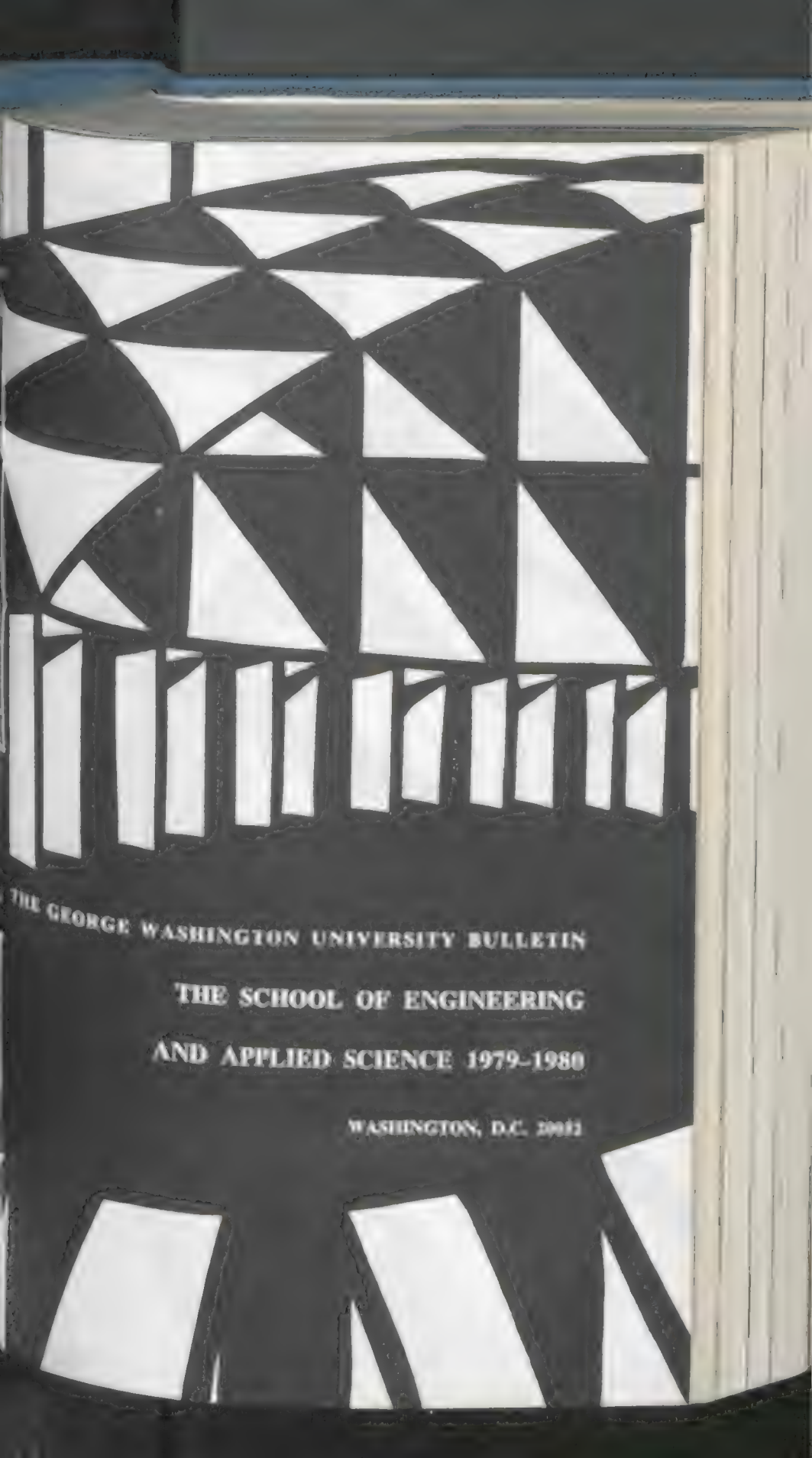
HOOL OF ENGINEERING AND APPLIED SCIENCE

THE GEORGE
WASHINGTON
UNIVERSITY
BULLETIN
(USPS 343-070)
Volume LXXVIII,
Number 2,
April, 1979

Published by The University
at Washington, D.C. 20052
SIX TIMES PER YEAR:
MARCH, APRIL,
MAY, JULY,
AUGUST, AND DECEMBER

Second Class Postage
Paid at
Washington, D.C.





THE GEORGE WASHINGTON UNIVERSITY BULLETIN

THE SCHOOL OF ENGINEERING AND APPLIED SCIENCE 1979–1980

WASHINGTON, D.C. 20052



CONTENTS

4 The Calendar
8 The Study of Engineering
11 The School of Engineering and Applied Science
12 Undergraduate Study
27 Graduate Study
38 Special Programs
49 Administration
50 Advisory Council
51 Programs of Study and Courses of Instruction
53 Applied Science Courses
58 Civil, Mechanical, and Environmental Engineering
58 Civil Engineering—Undergraduate Study
65 Mechanical Engineering—Undergraduate Study
70 Graduate Study
86 Civil Engineering Courses
93 Mechanical Engineering Courses
103 Engineering Science Courses
116 Electrical Engineering and Computer Science
116 Undergraduate Study
122 Electrical Engineering Courses
127 Computer Science Courses
129 Graduate Study
142 Electrical Engineering Courses
153 Computer Science Courses
162 Engineering Administration
180 Operations Research
192 Required Courses in Engineering Undergraduate Curricula Offered by Columbian College and the Graduate School of Arts and Sciences
197 General Information
197 Registration
198 Fees and Financial Regulations
202 Financial Aid
207 Prizes
208 Regulations
213 Consortium of Universities of the Washington Metropolitan Area, Inc.
213 Center for Academic and Administrative Computing
214 The Speech and Hearing Clinic
214 The Reading Center
214 Veterans Benefits
215 ROTC
215 Alumni Associations
215 Student Life
216 The University
226 History and Organization
226 The University Libraries
227 The Board of Trustees of the University
228 Officers of Administration
229 The School of Engineering and Applied Science Faculty and Staff of Instruction
230 Index

THE CALENDAR 1979-

1979	**FALL SEMESTER**
August 27	Orientation for new students from foreign coun... *Monday*
August 28	Orientation and placement tests for all new undergra... uate students *Tuesday*
August 28–29	Advising for all students *Tuesday–Wednesday*
†*August 30–September 1*	Registration—Tompkins Hall of Engineering *Thurs... Saturday*
	Application for February graduation due as part of ... istration
September 3	Labor Day (holiday) *Monday*
September 4	Classes begin *Tuesday*
November 1	Application for spring semester financial aid due *Th... day*
November 16	D.Sc. dissertations of February candidates due *Fri...*
November 21	Thanksgiving recess begins after last class *Wed...*
November 26	Classes resume *Monday*
November 30	Master's theses of February candidates due *Friday*
December 4	Last day of fall semester classes *Tuesday*
December 10–19	Examination period *Monday–Wednesday*

1980	**SPRING SEMESTER**
January 7	Orientation for new students from foreign co... *Monday*
January 8	Orientation and placement tests for all new undergra... ate students *Tuesday*
January 8–9	Advising for all students *Tuesday–Wednesday*
†*January 10–12*	Registration—Tompkins Hall of Engineering *Thurs... Saturday*
	Application for May graduation due as part of ... tion
January 14	Spring semester classes begin *Monday*
February 1	Deadline for submission of 1980-81 freshman ... financial aid applications *Friday*
February 18	Winter Convocation (holiday) *Monday*
March 1	Deadline for submission of 1980-81 continuing ... transfer undergraduate student financial aid appl... *Saturday*
March 8	Spring recess begins after last class *Saturday*
March 17	Classes resume *Monday*
March 21	D.Sc. dissertations of May candidates due *Friday*
April 1	Deadline for submission of Summer Sessions and ... 81 graduate financial aid applications *Tuesday*
April 4	Master's theses of May candidates due *Friday*
April 18	Last day of spring semester classes *Friday*
April 24–May 3	Examination period *Thursday–Saturday*
May 4	Commencement *Sunday*

* This calendar is subject to change

† The registration procedure and hours of registration will be stated in the *Schedule of Classes* which is available well in advance of each semester

1979

APRIL

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30					

MAY

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

JUNE

S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

JULY

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

AUGUST

S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

SEPTEMBER

S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30						

OCTOBER

S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

NOVEMBER

S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	

DECEMBER

S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

1980

JANUARY

S	M	T	W	T	F	S
6	7	1	2	3	4	5
13	14	8	9	10	11	12
20	21	15	16	17	18	19
27	28	22	23	24	25	26
		29	30	31		

FEBRUARY

S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	

MARCH

S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

APRIL

S	M	T	W	T	F	S
6	7	1	2	3	4	5
13	14	8	9	10	11	12
20	21	15	16	17	18	19
27	28	22	23	24	25	26
		29	30			

MAY

S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

JUNE

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30					

JULY

S	M	T	W	T	F	S
6	7	1	2	3	4	5
13	14	8	9	10	11	12
20	21	15	16	17	18	19
27	28	22	23	24	25	26
		29	30	31		

AUGUST

S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

SEPTEMBER

S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

OCTOBER

S	M	T	W	T	F	S
5	6		1	2	3	4
12	13	7	8	9	10	11
19	26	14	15	16	17	18
26	27	21	22	23	24	25
		28	29	30	31	

NOVEMBER

S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30						

DECEMBER

S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			



TO ALL PROSPECTIVE STUDENTS:

The School of Engineering and Applied Science has been in continuous
tion since 1884, and offers programs of study leading to Bachelor's,
ter's, Professional, and Doctor's degrees. Its prime objective is to de-
op in the student the precious asset of a well-trained mind which may be
plied to the attainment of our many national objectives. In these changing
mes, it is necessary to search for quality. Students and faculty have the op-
rtunity of assisting in the planning and implementation of educational pro-
ams. Examination is made periodically of the School's objectives and how
ey relate to those established by the Engineering Council for Professional De-
elopment (ECPD). Emphasis includes such items as the student's basic and
dvanced levels of education and role in present and future society.

This catalogue describes the programs and requirements for undergraduate
nd graduate study in the School of Engineering and Applied Science and in-
ludes information on the Cooperative Education Program in Engineering and
he Joint Institute for Advancement of Flight Sciences (JIAFS).

The Cooperative Education Program in Engineering provides the under-
raduate engineering student with the opportunity to obtain an enduring foun-
ation in engineering education by combining academic learning with practical,
nd-on experience in the student's chosen field of engineering. The student's
arnings will help to pay for a major part of the cost of an engineering
ducation.

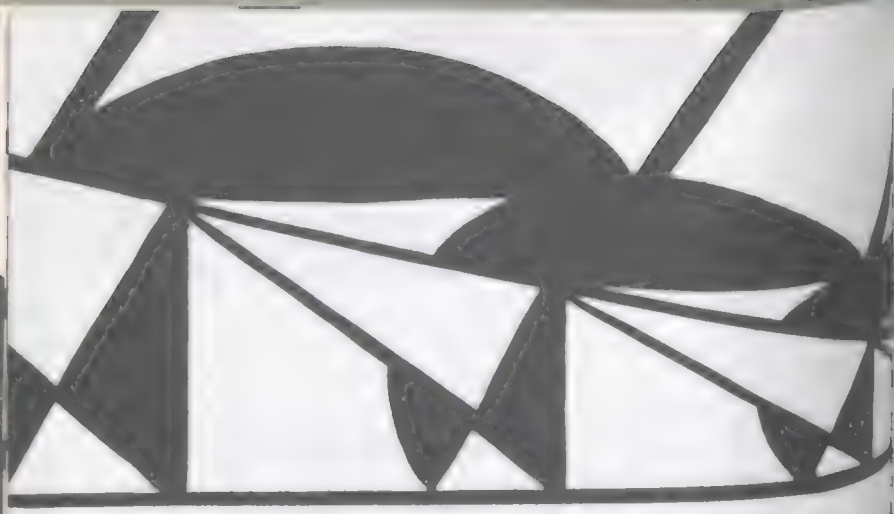
JIAFS was created by the joint efforts of the NASA-Langley Research Center
d the School of Engineering and Applied Science. The education and re-
arch opportunities offered in the program combine the academic resources of
eorge Washington University and the professional research resources and
cilities of NASA-Langley Research Center to prepare qualified graduate stu-
nts for careers in research, development, design, and teaching.

The School of Engineering and Applied Science is a professional school in
university comprised of eight degree-granting schools and colleges. The
vironment of the nation's capital is very favorable for the intellectual and
ltural development of the student. The metropolitan Washington area con-
ins the second largest concentration of research and development in the
nited States, and the engineering component of this activity is similarly
tensive, offering many employment opportunities to students after graduation.
The atmosphere of the School is one of serious-minded effort toward mature
velopment. Being a small school, it recognizes the individual as the single
st important element in the educational process. The student body, under-
aduate and graduate, has a primary interest in design, research, development,
d management in both scientific and engineering activities. Many alumni of
e School are successfully engaged in all fields of engineering—in science,
anagement, government, and education.

The philosophy of the School, which might be summarized as "education
r creativity, not conformity," has through the years reflected the many subtle
d profound changes in the engineering profession.

The faculty of the School and I look forward to a closer and more fruitful
ationship with you. If you need additional information, please do not hesitate
call upon the department chairmen or me.

HAROLD LIEBOWITZ
Dean



THE STUDY OF ENGINEERING

The Meaning of Engineering and Applied Science

THE RESPONSIBILITIES AND ACTIVITIES of the engineering profession ... into every aspect of industry and research and into many fields of ... and the arts. Engineers face problems in the production and distribution ... types of manufactured products, including the design of mechanical, ... and chemical processes, of equipment, and of plants in which such proc... made; in the design and construction of a variety of structures such as ... tunnels, harbors, and dams; in aircraft design and construction, includ... plicated electronic equipment for control, guidance, and communication; ... operation of transportation systems; in the automotive industry; in the ... and space programs; in energy resources and power and in the generation ... transmission of power; in modern communication; in traffic control; in city ... **ning; in public health and sanitation as it affects the environment,** ... ventilation and refrigeration. This list of applications is far from exhaustive ... does indicate, however, that engineering is a broad profession in which ... **are many opportunities to specialize.**

The Relationship of Engineering and Science

In any discussion of engineering and applied science, it is important to emphasize the distinction between engineering and science. The President's Science Advisory Committee points out that the engineer and scientist each play an important role on a team: "The scientist is one who seeks to extend the boundaries of knowledge in his chosen field. The engineer has the task of combining the knowledge of science with a knowledge and awareness of the needs and limitations of human beings and of a human society to design and create things for human use. . . . While scientists have contributed much basic knowledge, it is the engineers who have created the tangible tools, materials, and products that have revolutionized our daily lives, our economy, our living, and our national defense."

The work of engineers is a focal point at which scientific knowledge, the use of such knowledge as a service to society, financial considerations, human resources, and society's needs are interrelated. The engineer is concerned, therefore, with the means for operating a dynamic society, and must consider not only whether the knowledge that exists will enable the creation of a workable product, but also how the product can be built, who will use it, and how such use will affect the environment in which it will operate.

The Professional Engineer

Engineers are concerned with the quality and preservation of human life. Engineer, as the term is used in this bulletin and as it is commonly understood by society, refers to the person who makes use of the advances of science and technology in an economically feasible manner for the benefit of society. This process is complex and challenging. Although the content of engineering curricula is certainly scientific, the engineer has not lost a sense of purpose in serving as an intellectual agent in the practical world. This responsibility of the engineer arises from the breadth of the implications of engineering for the whole of society as well as from the depth of the requirements for competence. Technology has radically rearranged human life in our time. There are those who believe that, although the threshold of space has been crossed, the horizon of medical and engineering practice has been achieved, and breakthroughs have been made in other areas, this impact of engineering on modern life is just a modest preview of the engineering of tomorrow.

Engineering Education and the Student

The rapidly changing and progressing engineering activity requires an education for the future based on fundamental principles of science useful in applications in a dynamic, advanced society. In the fields of engineering and applied science there is no substitute for demonstrated ability and competence to solve the problems faced. Without question, achievement in particular courses of study is important. Equally important, however, is the ability to analyze and interpret all the aspects of a problem, to formulate solutions, and to evaluate those solutions in the light of all available information. To assure that the undergraduate education will enable students to meet these important goals, the faculty of the School of Engineering and Applied Science periodically evaluates and appraises the undergraduate program.

The curricula of the School of Engineering and Applied Science are founded on the basic principle of assisting the student in preparing for a career in engineering and applied science. This philosophy requires that the student master the principles on which future practice will be based. An education centered on that meaningful junction between theory and practice enables the engineer to follow the many interests and opportunities that may develop.

It should not be assumed, however, that only the intellectual elite should consider the study of engineering and applied science. Engineering, like medicine, law, education, science, history, government, and other disciplines, requires scholars. But in any of these areas the prospective student who has not

achieved high scholastic standing can find a place, if the student has genu
interest in the subject. The average student who is interested and willing
work will find in engineering and applied science a rich and varied field
study which can lead to satisfaction and success. It is difficult to make gene
izations in this area, but students who have demonstrated an aptitude
mathematics, science, and English will probably find the work of engineers a
the study of engineering and applied science satisfying and challenging.
nate intellectual curiosity and the desire to learn and to work hard are g
indicators of success. College Board examinations may reveal the capacity
undertake further study in mathematics and science and their applications
engineering. No school or college can "give" an education. It can offer
the opportunity to "get" an education. The George Washington Univers
School of Engineering and Applied Science is a small school which pro
an opportunity for close contact with faculty members, as well as the opp
tunity to participate in student organizations, and in many other student
tivities. The School recognizes the individual as the most important elemen
the educational process.



ACHOOL OF ENGINEERING
ND APPLIED SCIENCE

istory

HE SCHOOL OF ENGINEERING AND APPLIED SCIENCE was organized October 1, , as the Corcoran Scientific School of Columbian University and was ated in the University Building then at 15th and H Streets, N.W. The was named in honor of William W. Corcoran, Trustee and President he Corporation from 1869 to 1888. Day and evening courses were offered literature, science, and technology and led to the degrees of Bachelor of nce, Civil Engineer, Mechanical Engineer, and Mining Engineer. The hool was among the first to accept women for degree candidacy in engi-ng.

In 1903 the Corcoran Scientific School, the School of Graduate Studies, and e Columbian College were merged into a single Department of Arts and nces. Graduate engineering degrees were offered.

Administrative changes led to The Washington College of Engineering being ated in 1905 as one of the several semi-independent undergraduate colleges the University, each with its own Board of Trustees. The College provided truction leading to undergraduate degrees in engineering and architecture. In 1909 the name of the College was changed to the College of Engineering d Mechanic Arts, and the curricula were revised to give the student a thor-gh understanding of the theory underlying engineering practice. Emphasis s placed on the development of a knowledge of scientific principles upon h the student could build and by which he might solve new problems as s are met in practice.

The name of the School was changed again in 1914 to the College of Engi-ring and later to the School of Engineering. Architecture was dropped from curriculum, and degrees were limited to the field of engineering. However, primary emphasis upon principles rather than technology which had char-terized the School since 1903 was continued and has remained to this day as e of the important distinguishing features of the School.

In 1962 the name of the School became the School of Engineering and Ap-Science.

Academic Status

The George Washington University is accredited by its regional accredi
agency, the Middle States Association of Colleges and Secondary Schools.

The University is on the approved list of the American Association of
versity Women and is a member of the College Entrance Examination Bo

The undergraduate curricula in Civil Engineering, Electrical Engineer
and Mechanical Engineering are accredited by the Engineers' Council for Pr
fessional Development.

University Policy on Equal Opportunity

In accordance with the stated policy of its Board of Trustees and in co
formity with federal laws and regulations, The George Washington Univer
sity does not discriminate against any person on the basis of sex, race, co
religion, national origin, or handicap in any of its educational programs or
tivities. Federal regulations implementing Title IX of the Educational Amen
ments of 1972 and Section 504 of the Rehabilitation Act of 1973 call for
explicit statement that the requirement not to discriminate on the basis of
or handicap extends to employment in and admission to such programs and
tivities. The University is also subject to the District of Columbia Hu
Rights Law.

Inquiries concerning the application of this policy and federal laws and
regulations concerning discrimination in education or employment programs
and activities may be addressed to Marianne Phelps, Assistant Provost for
firmative Action, Rice Hall, Washington, D.C. 20052, or to the Director of
Office of Civil Rights of the Department of Health, Education, and Wel

Undergraduate Study

THE UNDERGRADUATE PROGRAM is intended to provide a solid foundation in
basic principles, concepts, and techniques underlying engineering and applied
science, on which the individual may build technical competence in a variety
of areas as his professional career develops. It is preparation for a career in
engineering or applied science, as it exists today and as it may develop in the
future.

Undergraduate study is the formal beginning of a lifelong continuing pro
gram of education. The School provides an environment that fosters the atti
tudes and disciplines essential to professional growth. Graduates, when they
receive the bachelor's degree, are prepared for productive work in the chosen
field and for further development and progress, both formal and informal.
The undergraduate curricula include courses in the humanities and social sci
ences to the extent necessary to develop a reasonable understanding and ap
preciation of these areas of knowledge.

Admission to the engineering program indicates that the student possesses
at least minimum preparation and the probable capacity to meet the academic
demands of this School. Since the School cannot predict either the student's
response to the academic demands or the program to follow for the most
effective development, the undergraduate program has been designed to offer
a variety of experiences through which the student may find the best path to
educational growth and maturity.

The School is a place for learning; for experiencing adventures of the mind
nd of the hands; for the formulation, exchange, and exploration of ideas. Dur-
g the undergraduate years the student is led to strengthen skills in analysis
nd talent for creative activity, through liberal use of project-type labora-
y work. Independent thought and original ideas receive higher evaluation,
n ine appraisal of student achievements, than the rote recital of information.
To provide the undergraduate engineering student with the opportunity to
with an enduring foundation in engineering education by combining academic
rning with relevant, real-world employment which provides practical, first-
nd experience in engineering, the School of Engineering and Applied Science
as a Cooperative Education Program in Engineering in which arrangements
ve been made with leading industrial and governmental organizations for
udent employment at prevailing salary rates. Every effort is made to place
e student in positions of employment that provide the best possible engi-
ering experience consistent with career plans. These work periods provide
e student with income that may be used to finance the major portion of
tion and other expenses. Entering freshmen, as well as transfer students
om community colleges whose completed work is equivalent to requirements
this program, can be admitted to the Cooperative Education Program in
gineering.

DMISSION TO UNDERGRADUATE STUDY

e School admits those applicants who can benefit themselves and society by
ciplined intellectual effort in its environment. In the selection process, there
no discrimination because of sex, race, color, religion, national origin, or
ndicap.

Admission is the first selective step in a long series of qualifying steps the
dent will take in his progress toward professional competence in engineer-
g. It indicates the School's belief that the applicant has at least the minimum
paration and ability to complete the curriculum successfully.
The applicant must be of good character and must have an academic back-
ound appropriate for the program of studies contemplated.

pplication for Admission

n applicant for admission obtains from the Office of Admissions of the Uni-
rsity or from the School of Engineering and Applied Science an application
k which must be filled out completely and returned with the $15* applica-
n fee.

dents From U.S. Institutions

scords presented become the property of the University and *cannot* be re-

plication fee must be by check or postal money order, payable to George Washington Univer-
. The application fee is waived for a student applying for readmission who was registered in
ree program at the time of the student's last registration at this University and who has not
registered at another institution.

FRESHMAN ADMISSION

Consideration for admission is based on the following:

1. An acceptable certificate of graduation from an accredited high sch showing at least 15 units;*

2. Scores on these two College Entrance Examination Board tests: the S lastic Aptitude Test (SAT) and the English Composition Achievement or on the American College Test (ACT), and the English Compos Achievement Test.

The principal's statement that the applicant is prepared to undertake col work may also be requested by the University.

The qualifications of applicants who, because of unusual circumstances not meet the above requirements will be considered by the School, which prescribe admission tests.

Nine and one-half of the 15 units required for entrance must be dis uted as follows: three in English, two in algebra, one in plane geometry, half in plane trigonometry, one in physics or chemistry, and two in histor one foreign language. General science may *not* be counted in satisfaction o science requirement but may be counted as an elective unit. It is recommen that *both* physics and chemistry be studied in high school.

An applicant must arrange to have sent directly *from his school to the* ... *of Admissions of the University* the secondary school academic record. information may be stated on a form supplied by the University or on a st ard form used by the secondary school, provided that all essential inform is included.

Quantitative Deficiency.—A graduate of an approved high school who ... not more than two units of the required subjects and who presents 15 acce able units may be admitted to a prescribed program which includes course make up the deficiencies.

Applicants who wish to begin study in the fall semester should form plans early in the high school senior year. Although the University prefer have applications submitted during the fall semester of the high school se year, applications may be submitted until August 1. However, students wis to be considered for financial aid should have their applications and quired documents submitted by Feb. 1. Students graduating at mid-term w ing to begin study in the spring semester *should* apply no later than Decem 15. Applications and all required credentials of students wishing to begin st in either the first or second term of the summer session must be received to April 15.

Although decisions on most applications for the fall semester will require mission of seventh-term grades and senior-year test scores, an earlier decis will be given after September 1 to a student whose application becomes com plete with a secondary school record through the junior year and ... test scores, provided these records clearly establish admissibility.

TRANSFER STUDENTS

Transfer students from other institutions (see page 24 for minimum residence requirement) should submit applications and required credentials prior to ...

* A unit represents a year's study in a secondary school subject, including in the ... than 120 sixty-minute periods of prepared classroom work

gust 1 for the fall semester, December 1 for the spring semester, April 1 for the summer sessions.

The transfer student must be in good standing as to scholarship and conduct. A student who has been suspended more than one time or academically dismissed will not normally be considered for admission.

An applicant who has attended one or more institutions of higher learning must request *each registrar* to mail directly *to the Office of Admissions of the University* a transcript of his or her record, *even if credits were not earned.*

If an applicant has fewer than 30 semester hours of acceptable work (*C* or better in academic courses from an accredited institution), at the time the application is submitted, the applicant must request that the high school record and College Examination Board SAT or ACT test scores be sent to the Office of Admissions.

If high school units are not shown on the college transcript, the applicant must request that the high school record be sent to the Office of Admissions.

Students from Foreign Institutions

The application, required records, and scores on the *Test of English as a Foreign Language* (TOEFL) (see below) or American Language Institute Georgetown University test (ALIGU) must be received from *all international applicants* no later than June 1 for the fall semester, November 15 for the spring semester, and April 15 for the summer sessions.

REQUIRED RECORDS

At the time the application is sent, the applicant must request the educational institution previously attended to send directly to the Office of Admissions copies of official certificates and records listing subjects studied, grades received, examinations taken, and degrees received. Certified copies of diplomas and certificates from all secondary schools, colleges, and universities attended are required. Records of state examinations and certificates are also required. These records become the property of the University and cannot be returned. These documents should be in the language in which the institution keeps its official records. If they are in a language other than English, the copies which are sent should be accompanied by an English translation.

Consideration will be given to academic documents delivered by the student if circumstances prohibit the receipt of official records.

LANGUAGE TEST

Students whose native tongue is not English are required to take the TOEFL (Test of English as a Foreign Language) or the ALIGU test (American Language Institute, Georgetown University). Students are responsible for making arrangements for taking these tests. Foreign students abroad should consult with the nearest U.S. Embassy for information on arrangements for taking ALIGU. Those interested in TOEFL should address inquiries to TOEFL, Educational Testing Service, Princeton, New Jersey 08540, U.S.A., well in advance of the beginning of the semester for which admission is sought. The test fee remitted with the application entitles the student to have the test score

sent to three different institutions. Registration for the *Test of English as a Foreign Language* or the ALIGU test does not constitute application for admission to George Washington University.

The TOEFL *Bulletin of Information*, obtainable without charge, contains a description of the test as well as rules regarding application, fees, reports, the conduct of the test; lists of examination centers; examination dates; and an application blank. On the application for the test, the student should specify that the scores be sent to the appropriate admissions office at this University (see "Admission to Undergraduate Study," pages 13–15, or "Graduate Admission Procedure," pages 27–28).

In addition to the TOEFL or ALIGU tests an admitted student may be required to take a test in English as a Second Language prior to registration. Results of this test will determine the courses the student will be permitted to register for in the program of study. If the knowledge of English is inadequate to enable the student to undertake any academic work, the student will not be admitted to register for any courses other than English and will be required to study English on a full-time basis. Students in this category should therefore expect to take a longer period of time to complete their graduation requirements than students who are not obliged to complete the additional English courses.

International students in the U.S. may take a locally administered George Washington University English placement test (a $10 fee is required for this examination) in lieu of the ALIGU or TOEFL test. Arrangements for this test may be made by contacting:

Dr. George R. Bozzini, Director
English for International Students
George Washington University
Washington, D.C. 20052

FINANCIAL CERTIFICATE

If a student plans to enter or remain in the United States to study at the University and the visa status will be either student (F) or exchange visitor (J), a Form I-20 or DSP-66 cannot be issued until the student has been admitted to the University and has completed the Financial Certificate satisfactorily. The Financial Certificate is a document which may be obtained from the School of Engineering and Applied Science. It requests information about the resources (money) available to the student to support his/her educational and living expenses while in the United States. The Certificate should be accompanied by supporting documents such as bank statements or letters from governments authorizing scholarship awards.

SPECIAL ENGLISH COURSES FOR INTERNATIONAL STUDENTS

The extensive experience of the Department of English with the language needs of international students has been synthesized into a comprehensive English Language Program that includes the following courses:

ENGLISH AS A FOREIGN LANGUAGE

20 Intensive Basic English (0)

Meets 20 hours per week. The objectives of the course are to strengthen the ability to use basic grammatical structures appropriately and to introduce increasingly complex structures; to build reading skills and to enlarge vocabulary through the use of specially adapted materials; to introduce the student to unadapted reading materials, such as newspapers; to focus on writing sentences; to familiarize the student with the cultures of the English-speaking peoples; and to foster multicultural sharing among international students. No academic credit. Tuition is charged at the rate of 8 semester hours; laboratory fee, $35.00.

30 Intensive Lower-Intermediate English (0)

Meets 20 hours per week. The objectives of the course are to increase the ability to use complex grammatical structures; to develop writing ability through the paragraph level and to improve reading skills; to enlarge vocabulary further and to encourage oral expression through practical conversation and laboratory exercises. No academic credit. Tuition is charged at the rate of 8 semester hours; laboratory fee, $35.00.

40 Intensive Higher-Intermediate English (0)

Meets 20 hours per week. The objectives of the course are to provide a comprehensive review of grammatical structure, including clauses; to expand vocabulary further through use of unadapted reading material; to increase reading speed and comprehension; to encourage oral expression of ideas encountered in the student's reading material. The course also includes instruction in composition which focuses on outlining and techniques of exposition. Tuition is charged at the rate of 8 semester hours; laboratory fee, $35.00.

45 Semi-Intensive Higher-Intermediate English (0)

Meets 10 hours per week. The objectives of the course are the same as for EFL 40. Students enrolled in EFL 45 may—with the authorization of the Admissions office of the school to which they are applying—take one undergraduate or graduate course concurrently with English. Tuition is charged at the rate of 5 semester hours.

50 Advanced English (3)

Meets 4 hours per week. An advanced-level composition course for students showing a high degree of academic proficiency in English. The aim of the course is to develop writing skills and to foster an understanding of technical writing. The course requires a writing assignment each week and a 10–20-page research paper. For the latter project, the student is introduced to library research methods. The course meets 4 class hours per week and also involves extensive individual counseling outside the classroom. Laboratory fee, $25.00.

The language laboratory is available to all students in the English Language Program. The laboratory contains a library of tapes that accompany the printed texts and a variety of listening and recording equipment, including individual recording and playback equipment.

Admission to a particular English class is determined by a suitable series of objective and nonobjective tests.

The English Language Program is administered by the College of General Studies and is offered in cooperation with the Department of English, Professor J.P. Reesing, Jr., Chairman. The English for International Students Program is under the direction of Dr. George R. Bozzini.

Provisional Registration of International Students

Outstanding international students who do not meet the minimum test scores for TOEFL or ALIGU may be admitted to the School on a "provisional" basis. This "provisional" admission requires the student to take an "English only" program until an improved English capability permits the student to take technical courses. After satisfactory completion of English language requirements, such students will be granted full admission status.

Readmission

A student previously registered in the University who was not registered on campus during the immediately preceding semester (summer session excluded) must apply for readmission. Final dates for applying are the same as those for undergraduate admission (see page 13), or graduate admission (see page 28). If the student applies as a degree candidate and was previously registered as a nondegree student, or if a student has attended one or more higher institutions while absent from the University, the student must have complete, official transcripts sent to the appropriate office at this University from each institution attended. Applications for readmission are considered on the basis of regulations currently in effect.

The application fee is waived for a student applying for readmission who was a degree candidate at the time the student last registered at this University and who has not since registered at another institution.

Advanced Tuition Deposit

After notification of acceptance, a $100 advanced tuition deposit will be required of all full-time undergraduate students including those readmitted. The deposit is due on May 1 or within 21 days of the date of notification of admission if after May 1 for students entering the fall semester, and December 15 or within 21 days of notification if after December 15 for students entering in the spring semester. The deposit is credited toward tuition and is not refundable.

Advanced Standing

CREDIT BY EXAMINATION

Assuming there is no duplication of course work earned, a maximum of 30 semester hours of credit may be assigned toward partial fulfillment of the engineering core curriculum upon admission to the University for each or any combination of the following:

College Entrance Examination Board Advanced Placement Tests (APT).—Credit is assigned for examinations passed with scores of 4 or 5 on the basis of a score report sent to the Office of Admissions from the Educational Testing Service at the student's request. Examinations passed with scores of 3 will be considered for credit or placement if the student arranges to have the examination paper sent to the Office of Admissions. The Advanced Placement Tests are administered in the secondary school in May of each year. Normally only students who complete a course designated as Advanced Placement are prepared for the examination. Arrangements for the examination are the responsibility of the applicant and should be made through the secondary school attended or with the Program Director, College Entrance Examination Board, Advanced Placement Tests, Box 592, Princeton, N.J. 08540, or Box 1025, Berkeley, Calif. 94701.

College Entrance Examination Board College-level Examination Program (CLEP).—CLEP offers two types of examinations: General and Subject Examinations. CLEP General Examinations are offered in five areas: mathematics, social sciences, humanities, natural sciences, and English composition. CLEP Subject Examinations measure achievement in specific college-level courses and are offered in more than 47 subjects.

New Students—Upon admission to degree candidacy in the School of Engineering and Applied Science, students may be assigned undergraduate credit for the General Examinations in the social sciences (six credit hours) and humanities (six credit hours) passed at the 50th percentile or above (college freshman norms); such credit is assigned in partial fulfillment of the 18 credit hours required in the humanities and social sciences. Credit is not assigned for the engineering curriculum for CLEP general examinations passed in the areas of mathematics, natural sciences or English composition.

Credit is assigned for the Subject Examinations which are applicable to the engineering curricula and which are passed at the level recommended in the College Board model policy.

Registered Students—A candidate for a degree (*i.e.*, a student already registered at the University before taking the CLEP examinations) must seek departmental approval prior to taking the CLEP examination for credit. Credit may not be earned by passing the examination after having taken the equivalent course or after having taken a waiver examination for the course.

Arrangements for the examinations are the responsibility of the applicant and should be made with the College Entrance Examination Board College-Level Examination Program, Box 1824, Princeton, New Jersey 08540.

Department Examinations for Waiver or Credit—Registered SEAS students may also take examinations in some departments for waiver of, or credit for, specific course (see Fees, p. 198) upon approval of the appropriate department chairman; the student must demonstrate sufficient preparation. An examination for credit is not allowed if an examination for waiver has been successfully completed or if the student has taken the course.

MAKEUP OF CREDIT FOR WAIVED COURSES

If a mathematics or natural science course required by the engineering c riculum is waived, the corresponding credit hours must be earned by satisf completion of a university-level course, either technical or non-technical, w is approved by the chairman of the department in which the student is enro

WAIVER OF THE ENGLISH COURSE REQUIREMENT

A waiver of the English course requirement in the core curriculum will be gr ed to those who achieve a score of 650 or higher on the English Compos Achievement Test of the College Entrance Examination Board.

CREDIT FROM INSTITUTIONS OF HIGHER LEARNING

Where there is no duplication involved either through course work or examin tion, advanced standing may be granted for work successfully completed a accredited institutions of higher learning. It will be granted only when it meet the requirements for the degree sought at this University and may be accep provisionally. Work of low pass grade (*D* or the equivalent) will not be co sidered for transfer.

Although there is no strict limit to the total amount of transfer credit th may be assigned, a student must satisfy the residence and course requirement for the degree sought at George Washington University.

CREDIT FROM TECHNICAL INSTITUTES

Advanced standing may be granted for work successfully completed at techn cal institutes. Credit will be granted for transferred work only when the appl cant passes successfully the required validation examination. Arrangement for the examination should be made with the appropriate department of the School Normally, no more than 30 semester hours of credit for technical work w be granted in transfer for those who graduated from a two-year technical insti tute. A maximum of 60 semester hours of credit for technical work may be granted in transfer for those who graduated from a four-year technical institute

CREDIT FROM SERVICE SCHOOLS

A limited amount of credit may be assigned for selected service school instruc tion received since 1941. No more than 30 semester hours may be assigned for a combination of service schools and examinations referred to above. Veterans should submit to the Office of Admissions photostatic copies of their service school records, indicating courses successfully completed with sufficient identifi cation of the course to locate it in the *Guide to Evaluation of Educational Experience in the Armed Forces*.

CREDIT FROM BALTIMORE POLYTECHNIC INSTITUTE

Credit will be assigned to Baltimore Polytechnic Institute "A" course gradu ates who have earned scores of 80 or above in the applicable courses equiva lent to the following engineering core curriculum courses: Math 31, 32; Phys 3, 15; Chem 13; Eng 4; EE 51.

REGULATIONS

Regulations regarding REGISTRATION, FEES, AND FINANCES *are stated on pages 198–202, other University regulations, on pages 208–213*

Attendance

Students may not attend classes until registration is completed and fees due are paid or appropriate arrangements are made with the Office of Student Accounts. Students may attend only those classes for which they are registered. Regular attendance is required. Students may be dropped from any course for excessive absence.

Students are expected to attend every meeting of the courses in which they are registered, fully prepared to carry on the work required. Students are held responsible for all work in their courses, and all absences must be excused before provision will be made for them to make up the work missed. Excuses for absences from examinations which have been announced in advance can be obtained only by written application to the instructor in charge of the course.

Academic Work Load

A full-time undergraduate student who is not on probation may register for no more than 20 semester hours. A student employed more than 24 hours a week who is not on probation may take no more than 10 semester hours. In exceptional cases these limits may be exceeded with the Dean's permission.

Advisory System

The School of Engineering and Applied Science encourages a close faculty-student relationship. Every entering undergraduate student is assigned a permanent faculty adviser to assist in orientation in the professional discipline. Faculty advisers counsel students on their programs of study, the achievement and maintenance of satisfactory scholastic performances, professional development, and extracurricular activity as part of the educational process. The adviser represents the student in all cases requiring faculty action.

Students must obtain their advisers' approval of programs of study prior to registration for each academic semester and summer session. Until the work required for the degree is completed, the student must consult the adviser in all academic matters. However, an adviser may not deny entry into any course or activity to which the student is entitled under the regulations of the School.

All students are encouraged to discuss college problems with their advisers or instructors at any time, and parents or guardians are invited to consult with the Dean, Associate Dean, department chairman, and advisers concerning any student problems.

Faculty advisers counsel students to the best of the advisers' professional knowledge, but the final reponsibility for a student's action lies with the student.

Scholarship

For scholarship requirements for graduation, see "Graduation Requirements," page 24.

Grades.— Grades are mailed to the student through the Office of the Registrar at the close of each semester. They are not given out by instructors.

The following grading system is used: *A*, Excellent; *B*, Good; *C*, Satisfactory; *D*, Low Pass; *F*, Fail. Whenever a grade has not been assigned, the symbol *I* (Incomplete) or the symbol *W* (Authorized Withdrawal) or the symbol *F* (for failure due to Unauthorized Withdrawal) will be recorded. The symbol *I* indicates that a satisfactory explanation has been given the instructor for the student's inability to complete the required work of the course.

At the option of the instructor, the grade of *I* may be recorded if a student, for reasons beyond his control, is unable to complete the work of the course, and if the instructor is informed of, and approves, such reasons before the date when grades must be reported. The grade may be used only if the student's prior performance and class attendance in the course have been satisfactory. Any failing to complete the work of a course which is not satisfactorily explained to the instructor before the date when grades must be turned in will be graded *F*. If acceptable reasons are later presented to the instructor, that instructor may initiate an appropriate grade change. Although the grade of *I* *may* remain on the records for a maximum of one year, the instructor should normally set a much briefer period within which the uncompleted work (usually the final examination or required paper) must be made up. The grade of *I* cannot be removed by the student's reregistering for the course here or taking its equivalent elsewhere. An *I* cannot be made up after the lapse of one calendar year.

Quality-point Index.—Scholarship is stated in terms of the quality-point index. The index is obtained by dividing the student's total number of quality points by the total number of semester hours for which the student registered.

Quality points are computed from grades as follows: Each grade is assigned a numerical equivalent—*A*, four points; *B*, three points; *C*, two points; *D*, one point; *F*, no points. The quality points for a course are obtained by multiplying the credit hours of the course by the numerical equivalent of the grade achieved. Courses marked *W* or *I* are not considered in determining the index. Courses marked *I* will be included once the *I* is converted to a regular letter grade. Grades in courses taken at other institutions are not considered in computing the quality-point index, with the exception of courses taken at one of the Consortium universities (see pages 197 and 213).

Mid-semester Warning.— At the end of the seventh week of each semester instructors report to the Dean the names of students whose scholarship is unsatisfactory. On receipt of a warning notice the student must consult the instructor and adviser immediately.

The adviser may prescribe diagnostic tests and or remedial study to be completed before the end of the current semester.

Probation.—A full-time student (one taking 12 semester hours or more) whose quality-point index based on all courses attempted in his most recent semester falls below 2.00 for that semester, or who receives two grades of *F* in one semester, will be placed on probation. A student enrolled for less than 12 semester hours during the fall or spring semester and a student enrolled during the summer sessions is subject to probation or suspension on the basis of the student's record for the most recent 12 semester hours, rather than on

the record in any one semester. The probation period is for one semester for full-time students, or the next 12 semester hours of study for part-time students.

To be removed from probational status, a student must earn a quality-point index of at least 2.00 in all courses taken during the period of probation and receive no grade of *F* during this period.

A student who fails to achieve a quality-point index of 2.00 for all courses completed during the probation period is continued on probation for an additional period of one semester or 12 semester hours of study.

Upon being placed on probation, a student may be required to undertake the Engineering Student Probation Program of testing, counseling, and remedial work available at the Counseling Center. A student on probation is required to follow a program of study prescribed by the adviser and department chairman, and is cautioned not to take more than 12 semester hours of study. The student is not eligible to participate in student activities.

Suspension.—The following cases constitute grounds for suspension: (1) two or more grades of *F* received during a probation period; (2) failure to achieve a quality-point index of 2.00 in a second consecutive period of probation; (3) failure of a student who has been on probation for three periods to achieve a quality-point index of 2.00 in the third period or any subsequent semester.

DEAN'S HONORS LIST

The Faculty of the School recognizes meritorious scholastic achievement by a Dean's Honors List, containing the names of candidates for undergraduate degrees whose scholastic achievement satisfies all of the following requirements:

1. The student must have completed a minimum of 13 semester hours in one semester with a quality-point index of 3.00 or higher and with no more than one grade of *C*.
2. No grade below *C* may have been received during the qualifying period.
3. No disciplinary action may have been taken with respect to the student.

The Dean's Honors List is prepared at the end of the fall and spring semesters and displayed in an appropriate public place in the School. A notation is made on the student's record each time his name is included in the List.

Use of Correct English

Any student whose written or spoken English in any course is unsatisfactory may be reported by the instructor to the Associate Dean. The Associate Dean may assign supplementary work, without academic credit, varying in amount with the needs of the student. If the work prescribed is equivalent to a course, the regular tuition fee is charged. The granting of a degree may be delayed for a student to make up any such deficiency in English to the satisfaction of the Associate Dean.

Graduation Requirements

See pages 210–211 for general requirements for graduation.

RESIDENCE

A minimum of 30 semester hours must be completed in residence. Summer work may be counted. Unless special permission is granted by the Dean to study elsewhere, the work of the final year must be completed in residence.

SCHOLARSHIP

To be eligible for graduation a student must have (a) a quality-point index of at least 2.20 in those technical courses specified in the fifth through the eighth semester of the curriculum, and (b) a 2.00 overall average.

HONORS

With Distinction.—A bachelor's degree may be conferred "With Distinction," at the discretion of the Faculty, if a student attains a quality-point index of 3.50 or higher on all work taken at this institution. To be eligible for this honor a student must have completed at this institution at least one-half of the work required for the degree and must petition the department chairman no later than the beginning of the student's final semester.

Special Honors.—A bachelor's degree may be conferred with "Special Honors," at the discretion of the Faculty, for outstanding achievement in the student's senior year work on recommendation of the Faculty, under the following regulations:

1. The student must have candidacy for Special Honors approved by the department chairman representing the major field not later than the beginning of the senior year.

2. The student must meet such other conditions as may be set at the time candidacy is approved.

3. No student will be awarded Special Honors unless a quality-point index of at least 3.00 is achieved on all work taken at this institution.

4. To be eligible for Special Honors a student must have completed at this institution at least one-half of the work required for the degree.

UNDERGRADUATE CURRICULA

The four-year undergraduate curricula lead to the degree of Bachelor of Science, with parenthetic designation of the major; for example, Bachelor of Science (Electrical Engineering). Students who are deficient in preparation require a longer period; those who are admitted with advanced standing or who attend summer sessions can complete the requirements in less time.

The program of the first four semesters (2 years), with minor exceptions, is common to all curricula and provides the essential broad base of scientific principles and mathematical techniques necessary for the professional courses of the last four semesters, together with an appropriate background in the humanities and social sciences (see below).

A minimum total of 130 semester hours is required to qualify for the degree. Certain options may require more than the minimum. However, students are encouraged to elect additional course work above the required minimum to the extent that their interests and the School's offerings permit.

Degrees are offered in Civil Engineering, Electrical Engineering, and Mechanical Engineering. Students in Civil Engineering may select options in Computer-oriented, Environmental-oriented, and Geotechnical Civil Engineering; students in Mechanical Engineering may select options in Computer-oriented Mechanical Engineering and in Energy Resources and Power-oriented Mechanical Engineering. Electrical Engineering provides options in Computer Science and Premedical Engineering.

The student is assisted by a faculty adviser, who approves the program each semester prior to registration. For the guidance of the student and the adviser, every beginning freshman takes the placement examinations in English and mathematics. A student who is deficient in mathematics may be required to take remedial work. Results on the English placement test determine the level of the English course the student will take.

Courses in the Humanities and Social Sciences

The program in the humanities and social sciences for engineering students assists them in acquiring knowledge which will permit an understanding of the social and humanistic elements of the past and present and an analysis of problems facing society today. The ultimate goal is to help the engineer have a better understanding of society and an appreciation of the engineer's role and responsibilities within it.

Since the education of an engineering student is, by necessity, oriented toward technical subjects, the program in the humanities and social sciences should not emphasize technical aspects and skills, but should rather consist of courses which broaden the outlook. As a consequence, courses in subjects such as accounting, finance, industrial management, introductory languages, and personnel administration should not be included in the humanities and social sciences program. On the other hand, courses in areas such as anthropology, economics, fine arts, geography, history, literature, philosophy, political science, psychology, and sociology are considered appropriate.

Each engineering student is required to prepare, with the assistance of the faculty adviser, a program of courses in the humanities and social sciences, explaining how the program meets the purpose stated above. The student's program must include a minimum of 18 semester hours and must be approved by both the adviser and department chairman.

Modern Laboratory Facilities and Research Opportunities

Laboratories at the School of Engineering and Applied Science are constantly updated to keep them in line with current engineering practice. Assignments in the classroom and laboratory are arranged to supplement each other. The learning experience is made more meaningful when coupled with research activities. Students may involve themselves in the various kinds of research activities in progress at SEAS. Research is being conducted in structural dynamics, fluid mechanics, thermal sciences, materials science, medical engineering, computer science, electronics, communications networks, energy technology, and other areas.

The varied laboratory facilities available to complement classroom study and conduct research include a computer laboratory with a Hewlett-Packard

Model 3000 time-share computer with virtual memory, providing on-line interactive time-shared computing with background batch processing simultaneously on as many as 16 terminals in FORTRAN, BASIC, COBOL, and SPL programming languages; an EAI Model 580 advanced analog/hybrid desktop computer with a capacity of 80 integrating amplifiers and eight comparator amplifiers, and a CDC 8090 digital computer system; a computed-aided design and graphics laboratory currently consisting of two Hazeltine 2000 CRT terminals, two printer units attached to the terminals, five acoustical couplers, four Tektronix Model 4013 graphic display units and incremental plotter, a Data General Nova 840 minicomputer system and high-speed paper tape reader; an MTS random-cycle fatigue testing system; a fully instrumented wind tunnel; a combined water tunnel and circulating water channel; a water pollution laboratory; an air pollution laboratory; a soil and foundation engineering laboratory; electrical engineering laboratory with oscilloscopes, signal generators, digital multimeters, power supplies, and other related equipment; microprocessor laboratory with modern microcomputers (Imsai Z80); digital computer laboratory with modern microcomputer trainers (6800 Microprocessors); a materials science and engineering laboratory with a electron scanning microscope; a thermal science laboratory; and general mechanical engineering and applied mechanics laboratories. Arrangements can also be made for use of special equipment at various government laboratories, such as the Naval Research Laboratory, the National Bureau of Standards, and the National Aeronautics and Space Administration.



Graduate Study

THE SCHOOL OF ENGINEERING AND APPLIED SCIENCE offers graduate study leading to the degrees of Master of Science, Master of Engineering Administration, and Doctor of Science, and to the Professional degrees of Engineer and Applied Scientist.

In its graduate programs, the School, as it does in undergraduate study, adheres to the educational philosophy of increasing the knowledge and understanding of the individual student by concentration on principles and their application rather than by encyclopedic coverage of techniques and specialized detail. Each program is individually planned according to the student's preparation and needs.

Graduate study may be undertaken in any field of engineering or applied science in which the School has adequate facilities and resources. Upon approval, the student may select courses in other departments of instruction in the University to serve specific needs or objectives. A complete list of available fields and areas of concentration is included under each departmental listing in the "Programs of Study and Courses of Instruction" section of this catalogue beginning on page 51.

THE MASTER'S PROGRAMS

The student's program may provide for broad coverage in a variety of fields or may be designed to provide a concentration in particular areas. The minimum program consists of 24 semester hours of approved graduate courses and a Master's thesis (equivalent to 6 semester hours). With the approval of the department the student may elect an optional program without a thesis which consists of a minimum of 33 semester hours of approved graduate courses. All Master's candidates are required to pass a Master's Comprehensive Examination. Students whose undergraduate study does not include necessary prerequisites may be required to take more than the minimum semester hours required.

Upon admission the student is assigned an adviser. Programs of study are determined by any prerequisites established and by the requirements of the department in which the student wishes to study. The program of studies in preparation for the Master's Comprehensive Examination must be approved by the student's adviser and the appropriate department chairman.

Admission

Admission to graduate study toward a Master's degree requires an appropriate Bachelor's degree from a recognized institution and evidence of capacity for effective work in the field selected, such as may be indicated by undergraduate grades, Graduate Record Examination scores, and similar data.

An applicant who has significant deficiencies in preparation may be required to take prescribed undergraduate courses as an unclassified student before being admitted to graduate student status. In some cases, if such deficiencies are minimal, he may be admitted to graduate student status and allowed to take a limited number of graduate courses while completing the undergraduate courses in which he is deficient. In no case may the undergraduate courses undertaken fulfill any part of the requirements for the Master's degree.

For additional admissions requirements for the degrees of Master of Engineering Administration and Master of Science in the Department of Engineering Administration, see pages 163 and 167; for the degree of Master of Science in the Department of Operations Research, see page 183. Candidates for the degree of Master of Science in the Department of Electrical Engineering and Computer Science must have satisfied specific undergraduate requirements depending upon the area of concentration.

ADMISSION PROCEDURE

Forms for application for admission are available at the School of Engineering and Applied Science. They must be submitted, together with the nonrefundable application fee of $25, to the Manager of Engineering Admissions, Room 101 Tompkins Hall of Engineering, George Washington University, Washington, D.C. 20052, no later than August 1 for the fall semester, December 15 for the spring semester, May 1 for the first summer session, June 1 for the second summer session, and July 1 for the third summer session. The applicant must request each educational institution attended since high school graduation to send an official transcript of the student's record directly to the Manager of Engineering Admissions. Although not required, the applicant who has completed the Graduate Record Examination should request that the scores be sent to the School. The applicant will be notified by mail when a decision on admission has been made. English language and other pertinent requirements for international students are outlined on pages 15–18.

All inquiries and correspondence relative to graduate admission should be directed to the Manager of Engineering Admissions.

TRANSFER CREDIT

Up to 6 semester hours of satisfactory credit (with grades of *A* or *B*), which normally must have been earned in a graduate program at another recognized institution, *may* be accepted in transfer, when applicable, to satisfy Master's degree requirements in this School. However, the student must, with the approval of the adviser, petition to the appropriate department chairman for such a transfer.

Registration

A graduate student may register for classes upon presentation of an official letter of admission or a Student Identification Card from the previous semester. No registration is accepted for less than a semester or one summer session.

Concurrent registration in this School and in another institution not a member of the Consortium of Universities of the Washington Metropolitan Area, Inc., or another division of this University requires the written permission of the Deans concerned, *prior to registration*. Allowance of credit for work done concurrently at another institution is at the discretion of the Dean.

Dates and hours of registration are stated in the Calendar, page 4, and in the *Schedule of Classes* published in advance of each semester.

Master's Thesis

In those programs requiring a thesis, the degree candidate must submit an acceptable thesis to demonstrate the ability to make independent use of the knowledge and discipline of thought acquired and developed by graduate study, to furnish objective evidence of constructive power in a given field, and to demonstrate the ability to communicate the results of the work in writing. Work of suitable character for which the student has professional responsibility may be considered, whether done on or off campus, provided no significant amount of work is completed without faculty supervision.

As a part of registration for the thesis course 299, the candidate must submit the thesis area to the appropriate department chairman, on the form obtained from the School office and approved by the faculty adviser. The candidate must submit the thesis title to the Dean, on the form available in the School office, at the beginning of the semester of expected graduation. Registration in thesis 299–300 entitles the student, during such registration, to the advice of the member of the faculty under whom the thesis is to be written. The student may consult the adviser, but the student has primary responsibility for the thesis.

The thesis in final form must be submitted to the appropriate department chairman by the date stated in the calendar for the semester in which the candidate enrolls in thesis 300. In case a thesis is unfinished on the date specified, the student will be granted an additional semester. If the preparation of the thesis extends beyond the three semesters, approval for an extension of time must be required and the student must reregister for thesis 300 and pay tuition fee for a repeated course. The overall time limit for earning the degree (see page 31) may not be exceeded.

A thesis may be submitted in final form one time. The acceptability of the thesis is determined exclusively by the Master's Comprehensive Examination Committee. If the thesis is unacceptable, the student's graduate status is terminated.

Printed copies of detailed regulations regarding the form and reproduction of the thesis are available in the Office of the School. Accepted theses, with accompanying drawings, become the property of the University and are deposited in the University Library, where the duplicate copies are bound and made available for circulation.

Optional Master's Program without a Thesis

With the approval of the department, a student may elect an optional program without a thesis which consists of a minimum of 33 semester hours of approved graduate courses.

Master's Comprehensive Examination

The student must pass a Master's Comprehensive Examination to demonstrate substantial understanding of principles and methods and their use in the area of interest. This Examination may be written, oral, or both. A graduate student who fails any portion of the Master's Comprehensive Examination on the first attempt may be examined one more time if approval is given by the appropriate Examining Committee. In the event of failure to complete the Examination satisfactorily, the student's graduate status terminates.

Regulations

Regulations regarding REGISTRATION, FEES, AND FINANCES *are stated on pages 198–202; other University regulations, on pages 208–13.*

ATTENDANCE

Students may not attend classes until registration is completed and fees due are paid or appropriate arrangements are made with the Office of Student Accounts. They may attend only those classes for which they are registered. Students are expected to attend every meeting of the course in which they are registered, fully prepared to carry on the work required. Students may be dropped from any course for undue absence.

SCHOLARSHIP

Grades are indicated as *A*, Excellent; *B*, Good; *C*, Minimum Pass; *F*, Fail; and *CR*, Credit for satisfactory thesis completion. Whenever a grade is not assigned the symbol *I* (Incomplete) or the symbol *W* (Authorized Withdrawal) is recorded.

Students who receive two grades of *F*, or three grades below *B*, are barred from further enrollment in graduate courses and, ordinarily, will not be readmitted to graduate study.

Pass-Fail Grading System.—All SEAS students who have a keen desire to advance their knowledge may take SEAS courses under the pass-fail grading system but such courses cannot be used toward any degree program in SEAS.

At the option of the instructor, the grade of *I* may be recorded if a student, for reasons beyond the student's control, is unable to complete the work of the course, and if the instructor is informed of, and approves, such reasons before the date when grades must be reported. The grade may be used only if the student's prior performance and class attendance in the course have been satisfactory. Any failure to complete the work of a course which is not satisfactorily explained to the instructor before the date when grades must be turned in will be graded *F*. If acceptable reasons are later presented, the instructor may initiate an appropriate grade change. Although the grade of *I* may remain on the records for a maximum of one year, the instructor should normally set a much briefer period within which the uncompleted work must be made up. The grade of *I* cannot be removed by the student's reregistering for the course here or taking its equivalent elsewhere. An incomplete which is not removed within one calendar year is automatically changed to an *F*.

A student may not repeat for credit a course in which the student has received a grade of *C* or above, unless required to do so by the department concerned. A written statement requiring the student to repeat such a course for credit must be submitted to the Registrar by the appropriate department chairman.

GRADUATION REQUIREMENTS

Thesis.—In addition to 6 credit hours of acceptable thesis, a student may graduate with either:

1. 24 course credit hours of *B* or better with no more than two grades below *B* of which only one *F* is permitted; or

2. A 3.00 quality-point index with a minimum of 24 course credit hours with no more than two grades below *B* of which only one *F* is permitted.

Non-thesis Option.—A student may graduate with either:

1. 33 course credit hours of *B* or better with no more than two grades below *B* of which only one *F* is permitted; or

2. A 3.00 quality-point index with a minimum of 33 course credit hours with no more than two grades below *B* of which only one *F* is permitted.

Quality-point Index.—Scholastic standing is computed in terms of the quality-point index obtained by dividing the number of quality points by the number of semester hours for which the student registered.

Quality points are computed from grades as follows: *A*, four points; *B*, three points; *C*, two points; *F*, no points, for each semester hour for which the student registered. Courses marked *W* or *I* are not considered in determining the index, except that courses marked *I* will be considered when a formal grade is recorded. Grades in courses taken at other institutions are not considered in computing the quality-point index, with the exception of courses taken at one of the Consortium universities.

RESIDENCE AND CONTINUOUS STUDY

All work for the degree must be done in residence (on the campus) except when special permission is granted by the chairman of the department. The student must maintain continuous enrollment in the School. Failure to do so breaks the student's registration, and the student must apply for readmission to the Master's degree program under whatever conditions and regulations are in effect at that time.

TIME TO COMPLETE MASTER'S DEGREE REQUIREMENTS

A full-time student in the Master's program is allowed a maximum of three calendar years to complete all degree requirements, from the date of the student's first graduate-student status registration in prerequisite or graduate courses. A part-time student in the Master's program is allowed a maximum of five calendar years. The time limit does not include any period of registration as an unclassified student before admission to graduate student status, nor does it encompass any specified period spent on approved leave of absence. Readmission is required upon expiration of leave of absence under the conditions and requirements then prevailing.

Students who do not complete degree requirements within the allowed time have their graduate status terminated. They may be readmitted to graduate status under conditions specified by the department chairman and approved by the Dean.

PROFESSIONAL DEGREE PROGRAM

The School of Engineering and Applied Science has established the Professional Degree program to provide an educational program for those students who are

interested in pursuing course work beyond the Master's degree, with emphasis on applied subject material rather than on basic research.

Successful completion of the Professional degree program leads to the degree of Engineer or degree of Applied Scientist.

In the Professional degree program, the School adheres to the educational philosophy of increasing the knowledge and understanding of the individual by concentration on principles and their application. This approach should provide the students with a technical flexibility to enable them to adapt successfully to rapidly changing technology. Each program is individually planned according to the student's background and needs and is subject to departmental requirements.

The Professional degree program has been designed to satisfy the needs of industry and government for highly trained and educated technical personnel in engineering and applied science.

Professional Degree Study Programs

The Professional degree program provides graduate study in those fields of engineering or applied science in which the School has adequate facilities and resources. Upon approval, the student may select courses in other departments of instruction in the University to serve specific needs or objectives.

The student's program may provide for broad coverage in a variety of fields or may be designed to provide a concentration in particular areas. The minimum program consists of 30 semester hours of approved graduate courses beyond a Master's degree. Students whose graduate study does not include necessary prerequisites may be required to take more than the minimum semester hours required.

Admission

Admission to graduate study toward the Professional degree requires an appropriate Master's degree from a recognized institution and evidence of capacity for productive work in the field selected as indicated by prior scholarship and, where appropriate, professional experience.

REQUIREMENTS

1. *Engineer.*—To study toward the degree of Engineer, an applicant must possess a Master's degree and a bachelor's degree in the area of engineering.

2. *Applied Scientist.*—To study toward the degree of Applied Scientist, an applicant must possess a bachelor's degree in either engineering, mathematics, or natural science; and a Master's degree in either engineering, natural science, mathematics, or administration. Applicants having an equivalent quantitative background may be considered as special cases by the respective departments.

Normally, a *B* average in graduate work is required. However, the minimum does not assure automatic acceptance; the departments may, and often do, set higher admission standards.

ADMISSION PROCEDURE

Forms for application for admission are available at the School of Engineering and Applied Science. They must be submitted, together with the nonrefundable

application fee of $25, to the Manager of Engineering Admissions, Room 103, Tompkins Hall of Engineering, George Washington University, Washington, D.C. 20052, no later than August 15 for the fall semester, December 15 for the spring semester, May 1 for the first summer session, June 1 for the second summer session, and July 1 for the third summer session. The applicant must request each educational institution attended since high school graduation to send an official transcript of the student's record directly to the Manager of Engineering Admissions. The applicant will be notified by mail when a decision on admission has been made. English language and other pertinent requirements for international students are on pages 15–18.

All inquiries and correspondence relative to graduate admission should be directed to the Manager of Engineering Admissions.

TRANSFER CREDIT

Up to 6 semester hours of satisfactory credit (with grades of *A* or *B*) beyond a master's program, which must have been earned in the five years preceding the date of study toward the Professional degree, may be accepted in transfer when applicable to satisfy Professional degree requirements in this School. However, the student must, with the approval of the adviser, petition to the appropriate department chairman for such a transfer.

Program of Study

Upon admission the student is assigned an adviser. Programs are determined by established prerequisites and the requirements of the department in which the student wishes to study. The program of studies for each candidate for the professional degree must be approved by the student's adviser and the appropriate department chairman.

An applicant who has significant deficiencies in preparation may be required to take prescribed undergraduate and graduate courses before being admitted to professional degree candidate status. In no case may these courses thus taken count any part of the requirements for the Professional degree.

Each individual department may require the degree candidate to undertake and defend the results of a technical design project, development problem, or the preparation of a comprehensive technical report to demonstrate the candidate's ability to make independent use of the knowledge and discipline of study acquired and developed by graduate study. When applicable, the student will be informed of this requirement by the faculty adviser at the time the student's program is being formulated.

In no case, however, will this project be more than 6 credit hours out of a minimum of 30 credit hours.

Scholarship

A student studying for the Professional degree may receive more than two course grades below *B*. If more than two course grades below *B* are received, he is terminated and further enrollment is prohibited. A student must achieve an overall quality-point average of 3.00 to receive the degree.

Time to Complete Professional Degree Requirements

A full-time student in the Professional degree program is allowed a maximum of three calendar years to complete all degree requirements, from the date of the first graduate student status registration in prerequisite or graduate courses. A part-time student in this program is allowed a maximum of five calendar years. The time limit does not include any period of registration as an unclassified student before admission to graduate student status, nor does it encompass any specified period spent on approved leave of absence. Upon expiration of leave of absence, readmission is required under the conditions and requirements in effect at the time of the student's readmission.

Students who do not complete degree requirements within the allowed time have their graduate status terminated. They may be readmitted to graduate status under conditions specified by the department chairman.

Interrelationship with the Doctoral Program

Candidates for the D.Sc. degree or Professional degree who are in good academic standing may, with the approval of the faculty adviser and department chairman, transfer from one degree program to the other, if they meet necessary qualifications and requirements as specified by the appropriate department.

Residence and Continuous Study

All work for the degree must be done in residence (on the campus) except when special permission is granted by the chairman of the department. The student must maintain continuous enrollment in the School. Failure to do so breaks the student's registration, and the student must apply for readmission to the Professional degree program under whatever conditions and regulations are in effect at that time.

THE DOCTORAL PROGRAM

The School of Engineering and Applied Science offers a program of advanced study and research leading to the degree of Doctor of Science. This program is limited to those fields in engineering or applied science in which a discipline has been established and for which the University has or can arrange adequate resources.

The doctoral program is designed to prepare the student for a career of creative scholarship by providing a broad but balanced background of knowledge and guidance in the performance of research. It requires study of interrelated fields of learning as well as original research in the field of central interest.

The program for the degree is divided into two stages. The first—consisting of a study of interrelated fields of learning which supports the general area of research concentration—culminates in the qualifying examination. The second—composed of research investigation of a particular subject in a specialty and the presentation of such research findings in a written dissertation—culminates in the final examination.

Admission to Doctoral Study

A satisfactory Master's degree from an accredited institution is required, together with acceptable personal qualities and a capacity for creative scholar-

ship. Normally, a *B* average in graduate work is required. However, the minimum does not assure automatic acceptance: the departments may, and often do, set higher admission standards.

APPLICATION FOR ADMISSION

Forms for application for admission are available at the School of Engineering and Applied Science. They must be submitted, together with a nonrefundable application fee of $25, to the Manager of Engineering Admissions, Room 103, Tompkins Hall of Engineering, George Washington University, Washington, D.C. 20052. The prospective doctoral student seeking admission should apply before June 1 for the fall semester and before December 1 for the spring semester. Personal interviews may then be arranged to discuss the applicant's qualifications and the possibilities for an effective doctoral program. The applicant must arrange for complete documentary records (transcripts) to be forwarded to the Manager of Engineering Admissions in sufficient time to permit assembly of complete records for evaluation as soon after the above application deadlines as possible.

The applicant must arrange for letters of recommendation to be submitted from two faculty members of the institution from which the student received his Master's degree; one of these, if possible, should be from the Master's adviser. The letters should be addressed to the appropriate department chairman. The English language and other pertinent requirements for international students are given on pages 15–18.

Language Requirement

A doctoral student should maintain a broad outlook as he pursues his study, and therefore must have the capability of reading appropriate literature published in a foreign language. Accordingly, a reading knowledge of one foreign language, preferably Russian, must be demonstrated before admission to the qualifying examination. If the student wishes to satisfy this requirement with a language other than Russian, he must obtain the approval first of his doctoral adviser, then of his department chairman; permission to use a language other than Russian will be granted on the basis of its importance to the student's field of interest.

Tool Requirement

In addition to the language requirement, an examination in a tool requirement (*e.g.*, computer programming) may be established by the various departments.

Study for the Qualifying Examination

Upon admission to the first stage of the program, *i.e.*, study of interrelated courses culminating in the qualifying examination, the student is assigned a faculty adviser who directs his studies.* The adviser approves appropriate fields of study to insure the student's breadth of knowledge and to support research in the central field of interest, gives advice concerning the scope and content of courses of study, and guides preparation for the qualifying examination. Programs of study are normally structured to include a major field of study and one minor or supporting fields.

A minimum of 30 semester hours of credit in a formal program at the graduate level beyond Master's study is required. In many cases, particularly when

* In some departments, instead of a faculty adviser, a faculty committee may be appointed to approve programs, direct study, and carry out all other responsibilities of the faculty adviser.

the student undertakes a doctoral program in a field other than that in whi
the student obtained the Master's degree, the program of studies exceeds
semester hours.

Students admitted to doctoral study are encouraged to undertake one year
full-time study on campus. In general, the adviser will require the student
register for a minimum of 6 semester hours of course work in every semes
except the summer sessions.

Transfer of Credit

Up to 6 semester hours of credit earned in courses completed with the gra
of *A* or *B* while enrolled in a doctoral program at another accredited insti
tion may be accepted in transfer to satisfy doctoral requirements of this Scho
subject to the approval of the student's adviser and the department chairma
Credit earned in courses completed more than five years prior to admission
the doctoral program will not be accepted in transfer, and some departme
may require that transfer credit must have been earned within a shorter per
of time before admission.

The Qualifying Examination*

The purpose of the qualifying examination is to ascertain that the student
background and intellectual development are adequate to support doctoral
search in the central field. Qualifying examinations may be written or oral
both, and are scheduled over a period of several days. They are conducted o
during the fall and spring semesters on dates established by the departme
and are administered by a faculty committee. Upon favorable report of
examiners to the Dean through the appropriate department chairman, the
dent is admitted to candidacy for the degree; the student then begins specia
study and research under the supervision of a designated member of the
ulty or, in special instances, an outstanding engineer/scientist who is no
member of the faculty.

The qualifying examination is the principal means used to determine
student's ability to qualify as a candidate for the doctoral degree and to en
the second stage of the program.

At the discretion of the committee which prepared the examination, the
toral student may be given a second opportunity to qualify for candidacy in
event of failure in any part of the qualifying examination. In general, the
qualifying examination must be retaken by the student in order to qualify
candidacy.

Scholarship

To be admitted to the qualifying examination, the doctoral student must achi
an overall academic average of 3.20 on a scale of 4 (a grade of *A* equals
points; *B*, 3 points; *C*, 2 points; and *F*, 0 points). No doctoral student ma
ceive more than two course grades below *B*. If the student does receive
than two course grades below *B*, the graduate study is terminated and
enrollment is prohibited. Courses in which the student earns grades be
are not included in the total semester-hour requirement for the degree. A
dent who receives any grade below *B* is required to consult with the advis
a review of the student's program of study and discussion of possible ch
therein.

* Some departments may administer a pre-qualifying examination prior to completion of the
program.

Research, Dissertation, Final Examination

The student admitted to candidacy for the degree of Doctor of Science requests the Director of Research the member of the faculty under whom the student wishes to conduct research. The faculty member may accept or reject such request. The research area is approved by the Director. Throughout the remainder of the doctoral program the candidate conducts dissertation research directly under the Director. However, the student is not precluded from consulting with other members of the faculty, as may be required, on an informal basis, and may be encouraged to do so by the Director of Research. A committee of the faculty consisting of three members including the Director as chairman will advise in the final preparation of the dissertation. The department chairman appoints such a committee on the recommendation of the Director of Research. Work on the dissertation is equivalent to a minimum of 24 semester hours.

THE DISSERTATION

A dissertation is required as evidence of ability to perform original scholarly research and to present and interpret the results. The student is solely responsible for the content of the dissertation.

The aim of the student in this stage of candidacy is the production of a dissertation which embodies the results of an extended original study and which includes material deemed worthy of publication in recognized scientific and engineering journals. The student is expected to attempt to publish the results of the research as soon as possible after the student receives the degree and to submit copies of the published material to the Dean. Credit must be given in the publication to the fact that the material is abstracted, summarized, developed, etc., from a dissertation submitted to George Washington University in partial fulfillment of the requirements for the Doctor of Science degree.

The candidate must submit to the appropriate department five complete copies of the dissertation and an abstract (not to exceed 600 words) of the dissertation no later than the date specified in the calendar. The abstract is included in the announcement of the examination and is reproduced by University Microfilms, Inc. One copy of the dissertation is also sent to University Microfilms, Inc.

Printed copies of detailed regulations regarding the form and reproduction of the dissertation, preparation of the abstract, and services offered by University Microfilms, Inc., are available at the School office. The successful candidate for the doctorate is required, before receiving the degree, to pay a fee to cover a part of the expense of printing the abstract of the dissertation, and for the basic service rendered by University Microfilms, Inc. Accepted dissertations, with accompanying drawings, become the property of the University and are deposited in the University Library, where bound copies are available for circulation.

THE FINAL EXAMINATION

Upon acceptance of the dissertation by the committee, consisting of the Director and two other faculty members of this School, which has assisted in super-

vising its final preparation, the candidate is presented for the final examinat
The final examination is oral and is open to the public. The candidate m
demonstrate a mastery of the special fields of study and of the materials a
techniques used in the research. The committee of examiners will consist of
less than five members, three of whom must be members of the faculty on
time service. The committee may include qualified experts brought to the U
versity especially to participate in the examination. The Director of Resea
serves as Advocate for the candidate. When the candidate satisfies the exam
ing committee of the high quality and originality of the candidate's contribu
to knowledge as well as the mastery of the scholarship and research techniq
of the field, the committee of examiners recommends the candidate for the
gree of Doctor of Science. The final examination is conducted only during
fall and spring semesters. The candidate should consult with the appropr
department chairman as to possible dates for the examination.

Residence and Continuous Study

All the work for the degree must be done in residence (on the campus), e
cept when special permission is granted by the chairman of the departm
The student must maintain continuous enrollment in the School. Failure to
so breaks the registration, and the student must apply for readmission to co
toral study under whatever conditions and regulations are in effect at that t
In case of incapacity or other legitimate reasons, the student may be grante
leave of absence of up to one year. Extension of such leave will require s
cial request to and approval of the appropriate department chairman. D
approved leave of absence, the student must maintain continuous enro
ment. The time period for completion of all requirements for the degree w
be adjusted on the basis of the approved leave of absence.

In general, one year of study is the minimum amount of time to be spent
preparation for the qualifying examination. The qualifying examination m
be completed within five years of the date of admission, and the entire degr
program must be completed within seven years. After admission the stud
may apply for the qualifying examination whenever the student feels prop
prepared. A minimum of two years of full-time study and research should
expected in meeting the requirements for the degree.

Special Programs

INSTITUTE FOR THE STUDY OF FATIGUE, FRACTURE, AND STRUCTURAL RELIABILITY

The basic objective of the Institute for the Study of Fatigue, Fracture, and
Structural Reliability of the School of Engineering and Applied Science is
develop an interdisciplinary approach to fatigue research through close coop
tion of research workers from different fields. The Institute deals primar
with the study of the physical mechanism of damage initiation, in order
establish principles for the rational design of metal alloys of superior fatig
performance on the one hand, and to develop advanced methods of fatig
design and reliability on the other. Because of the large volume, past and
rent, of straight fatigue testing of standard test specimens in industrial, gov

ment, and university laboratories, no testing of this type is generally conducted by the Institute. However, results of such tests appearing in publications and reports are carefully scrutinized for their significance in terms of the purposes of the Institute. In addition to advancing interdisciplinary research, the Institute provides specialized training for graduate students.

The Institute conducts seminars, issues technical reports, and supplies information, lectures, and consultations to many government and industrial research and development laboratories.

INSTITUTE FOR MANAGEMENT SCIENCE AND ENGINEERING

The Institute for Management Science and Engineering defines and develops new analytical management techniques required to keep pace with an ever-expanding technology. It provides a multidisciplinary environment for innovative graduate teaching and substantial opportunities for research activities and public service under diversified sources of external support. The principal academic fields directly involved are operations research, mathematics, statistics, economics, and the computer sciences.

The programs of the Institute are concerned with important educational and public-service needs for conservation of national resources. Such programs require full-time interaction among students, faculty, and staff in ways possible only at universities. Through its Program in Logistics, the Institute performs research leading to the development of a science of logistics featuring principles and methodology for resource allocation problems in civil affairs and national defense efforts. Other programs involve optimization, reliability, queuing, forecasting, and cost benefit analyses.

Participation by faculty members and graduate students from all schools of the University is encouraged as consistent with the multidisciplinary objectives of the Institute. Graduate students are supported through research assistantships with thesis and dissertation efforts ordinarily being the major work responsibilities. Reliance is also placed on staff research specialists, and there are special provisions for substantial contributions from distinguished visitors from government, private industry, and other universities.

The Institute disseminates its results through seminars, colloquia, conferences, and a special series of monographs. All research is unclassified.

THE GWU–NASA-LANGLEY GRADUATE PROGRAM

George Washington University, in cooperation with the National Aeronautics and Space Administration's Langley Research Center, has a full-resident graduate engineering program at NASA-Langley, in Hampton, Va., approximately 100 miles south of Washington, D.C.

The program is open to qualified NASA employees and area residents. Courses may also be taken by nondegree students, with the approval of the instructor. Students may be permitted to transfer a maximum of 6 semester hours of approved graduate course credit from other accredited institutions.

Courses in the program are taught by NASA scientists and engineers and the faculty of the School of Engineering and Applied Science. NASA-Langley's extensive scientific and engineering facilities and equipment are utilized wherever feasible.

The program at NASA-Langley leads to the degrees of Master of Scien and Doctor of Science (by special permission of the appropriate departme chairman) and to the Professional degree of Engineer in the fields of acoust aeronautics, environmental modeling (M.S. degree only), fluid mechanics a thermal sciences, solid mechanics and materials engineering, structures and d namics, and electrical engineering and computer science.

Information regarding this program may be obtained from John L. Wh sides, Jr., GWU-NASA Program, Mail Stop 69, NASA-Langley Research Ce ter, Hampton, Va. 23365.

The GWU–NASA-Langley Joint Institute for Advancement of Flight Sciences (JIAFS)

The Joint Institute for Advancement of Flight Sciences was established in 19 through the combined efforts of the National Aeronautics and Space Admin tration's Langley Research Center and the George Washington Univers School of Engineering and Applied Science. The objective of the JIAFS pr gram is to meet the nation's ever-increasing needs in the advancement science, engineering, and technology and to prepare qualified students for reers in research, development, design, and teaching. The Institute, which located at the Langley Research Center in Hampton, Virginia, is dedicated the advanced training of students and professional engineers in acoustics, aer nautics, environmental modeling, materials science, structures and dynami and other relevant areas, and serves to provide a center for advanced resea by bringing together researchers and scholars from these fields for the exchan of ideas and findings. It is also the purpose of the Institute to provide necessary facilities for qualified researchers and scholars who want to engag in research work in these areas.

The organization of the Institute consists of a director, John E. Duberg, A sociate Director of the NASA-Langley Research Center, and a co-direct Harold Liebowitz, Dean of the George Washington University's School Engineering and Applied Science.

The education and research opportunities offered in the program combine academic resources of George Washington University and the professi research assets and facilities of the NASA-Langley Research Center. The opportunities also enable students to involve themselves in research projec that excite their interest and permit them to associate with prominent visiti members who are working on related problems. Most of the faculty an NASA scientists conduct research, and students take part in the intimate ass ciation of research and instruction from the day of their arrival. It is believ that the experience of the students during their stay at NASA-Langley Resea Center will be highly rewarding and beneficial.

The current education and research programs are the following:

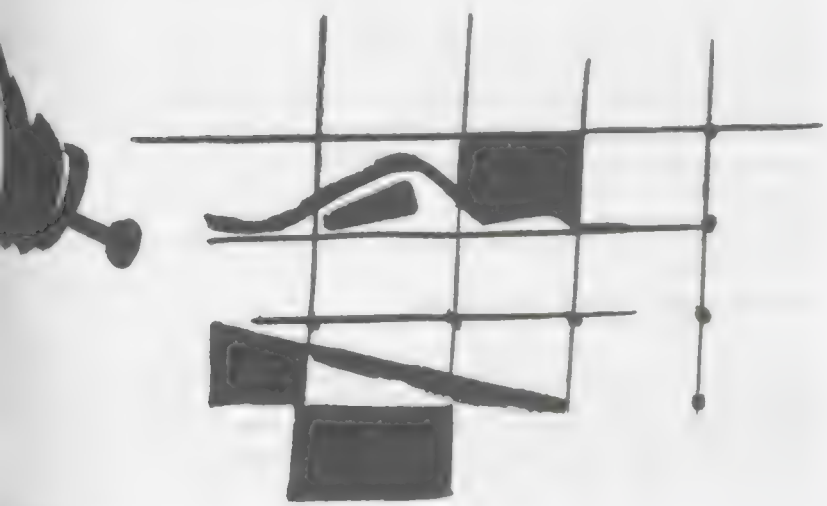
Acoustics Program.—This program is concerned with the problems of alle ating noise and with providing a technical base for design of acceptable air and space vehicles, noise resistant structures, and ground transportation syste Areas of research interest include boundary-layer noise, duct acoustics, jet n nonlinear problems in acoustics, rotor noise, structural response to noise, m chanical and acoustical coupling problems, and subjective response to noise vibration.

Aeronautics Program.—This program deals with advanced flight concepts of ...n STOL and V/STOL aircraft, including areas of performance, flight dynam... instrumentation, guidance and control, aeroelasticity, and systems analysis. ...ecific research areas currently being investigated include aerodynamic analy... of jet augmented wings, theoretical fluid mechanics, performance, stability ... control of V/STOL aircraft, analysis and flow visualization of wingtip vor... wind tunnel and flight testing of V/STOL aircraft, airfoil aerodynamics, ...spin characteristics of aircraft, and experimental evaluation of aircraft ...ling characteristics.

...tructures and Dynamics Program.—This program is designed to provide ...sic understanding and working knowledge of some key areas pertinent to ...ctures, solid mechanics, and dynamics technology including computer-aided ...n: optimum design of aircraft and of aerospace and other structures; and ... dynamic and aeroelastic response of large and complex structures. Em... will be placed not only on these individual areas but also on their inter... and interaction.

...vironmental Modeling Program.—This program is aimed at develop... mathematical models of various aspects of atmospheric energy and mass ...port and in applying these models both to the prediction of pollutant dis...on and transport and to the interpretation of satellite and aircraft meas...ents. Because of the complexity of the earth-atmosphere system, simplified ...els are necessary to understand the effects of pollutants on the energy bal... the atmospheric circulation, and the chemistry of the system.

...Materials Science Program.—This program is concerned with analytic ...d experimental verification of processes which degrade mechanical properties ...anced composites; analysis of corrosion and stress-corrosion of materials ...environments encountered by aerospace vehicles; analysis of creep and cyclic ...p materials, based on both deterministic models and multiparameter regres... and prediction of mechanical properties of engineering materials in terms ...omposition, processing conditions, and service history.



Participating in these programs are Graduate Student Research Scholar Assis ants, faculty from George Washington University, scientists and engineers fro NASA-Langley, and visiting scientists and engineers.

A number of Research Scholar Assistantships are available to qualified stu dents seeking an outstanding opportunity for graduate study and research lea ing to the degrees of Master of Science and Doctor of Science in the fields o Acoustics, Aeronautics, Environmental Modeling, Materials Science, and Stru tures and Dynamics. Applicants who are awarded Research Scholar Assistan ships will receive stipends of up to $8,000 a year for a Master of Science de gree and $9,000 a year for the Doctor of Science degree. Applications a JIAFS brochure, and additional information may be obtained from Professo S.W. Yuan, JIAFS, School of Engineering and Applied Science, George Wash ington University, Washington, D.C. 20052.

COOPERATIVE EDUCATION PROGRAM IN ENGINEERING

Cooperative education is a process of education which formally integrates th student's academic study with work experience in cooperating employer organ zations. The usual plan is for the student to alternate periods of college study with periods of experience in appropriate fields of industry and government The experience periods are considered an integral part of the student's educa tion. Through the interaction of the study and work experiences, the student enhances academic knowledge, personal development, and professional prepara tion. The teaching faculty, the coordinators, and the employing supervisor share in the educational process of the cooperative student.

The following factors are adhered to as closely as possible for the student's working experience:

1. The student's employment is related as closely as possible to the field of study and to individual interest within the field.

2. The employment is considered to be a regular, continuing, and essential element in the educational process.

3. The working experience will ideally increase in difficulty and responsi bility as the student progresses through the academic curriculum. Normally the salary of the student will increase accordingly.

The student's working experience in industry or government provides the opportunity to meet and work with men and women under varied conditions, to get along with them, learn from them, respect them, and earn their respect. Indeed, these advantages alone could be as important in shaping a young per son's life as the opportunity to obtain experience in a chosen field.

International students face several constraints in finding jobs and should not depend on cooperative education income as a financial aid. International stu dents with permanent visas, however, will have better opportunities for jobs

Advantages of Cooperative Education

Combines Theory and Practice.—By coordinating the work experience in industrial and governmental organizations with the campus education program, theory and practice are closely integrated, and students find greater relevance in their studies. As a result of this alternation between academic and industrial environments, the student tends to understand the role and meaning of each environment, with a deeper appreciation for each.

Helps Finance Educational and Living Expenses.—The student's earnings will ...ribute substantially to financing his own education and living expenses, lead... to independence and contributing significantly to self-esteem and con...nce. As stated earlier, it is expected that as the working experience in...ses in difficulty and responsibility as the student progresses through the ...demic curriculum, the salary of the student will increase accordingly.

...ves as a Bridge to the Future.—Cooperative education helps markedly to ...ot students to the world of work. Most students are genuinely concerned ...t their future life work. They want to know more about the range of occu...ns open to them, and the potentials and limitations of these fields. They ...t to know about the qualifications demanded and their own fitness. Through ...perative education programs, students have opportunities for exploring their ...abilities in connection with real jobs, and they find a direct means of gain... information and guidance not only in the occupations in which they are em...d but in a number of related fields as well. They have a chance to test ...r own aptitudes more fully than is normally possible on campus.

...creases Motivation to Achieve.—This coordination of work and study in...ses student motivation. As students see connections between jobs they hold ... the things they are learning in school, greater interest in academic work ...ops. During the work periods there is a tendency for the student to de... good work habits because his efforts as a productive and salaried employee ...rated by the employer.

Enhances Human Relationships.—Because the work experiences involve the ...dents in relations with co-workers who come from a variety of backgrounds, ... because success in these jobs requires constructive relationships with col...es, most students in cooperative education develop deeper understanding ...ther people and greater skills in human relations.

...ugments Development of Maturity.—For many students the work experi...e contributes to an increased sense of responsibility for their own efforts, ...te dependence on their own judgments, and a corresponding development ...turity. In addition, the student's role as a team member in a real and pro...ve working environment inculcates a seriousness of life and purpose which ...ten delayed for the traditional college graduate.

...ponsibilities of the Cooperative Student

...cooperative student working in association with the professionals in the field ... adopt professional standards of conduct. Such a student is also a repre...tive of the George Washington University School of Engineering and ...ed Science. After each work period the student prepares a report describ... the duties and responsibilities at work, and the supervisor sends an appraisal ...the student's work performance to the Cooperative Program Coordinator. ... reports are reviewed with the student.

The cooperative program is a three-way partnership among the student, the ...loyer, and George Washington University. The student's responsibilities ...d equally to each of the other two members of the partnership, and the ...nership cannot be altered during the program without the knowledge and ...ent of all.

The cooperative student must maintain continuous enrollment in the School ... each semester the student is away from the School on a work period. ...re to do so breaks the student's registration, and the student must apply ... readmission to the undergraduate degree program under whatever condi... and regulations are in effect at that time.

Why Employers Participate in Cooperative Education Programs

Industry and government agencies have found that cooperative students a valuable employees. Generally speaking, they are alert and energetic yo people who, stimulated by a definite goal, return more than a day's work fo day's pay. Graduates of the cooperative program represent a good source well-trained manpower. The training period provides an opportunity for employer to evaluate the student as a prospective permanent employee. E ployers feel that this program is an important part of their effort to attract wel qualified employees. At the same time, the student is able to evaluate the em ployer in terms of future plans and interests. About half of the cooperati graduates establish such mutually beneficial relationships with their employe that they remain in permanent employment after graduation, with a substanti head start in their careers.

It is emphasized, however, that neither the student nor the employer is ob ligated for permanent employment after graduation. Industry and governmen agencies consider participation in cooperative education as a long-range invest ment rather than a current expense. As a partner with the University, the em ployer is engaged in a joint effort to develop young talent more fully, thus as suring better education for the student, improved utilization of the graduate and greater cooperation with the University.

Scholastic Requirements

Students entering the program must be in good academic standing and mus have completed at least two semesters of academic study prior to their first full time work assignment. To remain in the program, the student must maintain a passing average and perform satisfactorily for the employer.

Living Accommodations

Arrangements will be made for students in the cooperative program to retain their dormitory and dining privileges at the University, if they so desire, during the work periods. During this time, they will also retain full student privileges and have access to all University facilities. Faculty will be available for con sultation by appointment.

Work-Study Schedules

At this time, individual schedules are being arranged with the various employ ers in Washington and other areas. Since each employer operates differently special schedules are arranged which are mutually satisfactory to the student the employer, and the School.

Generally, after the student has successfully completed the first year of study, a schedule is arranged with the employer. Many employers will require the student to work during the summer immediately following the freshman year. The student returns to the School for the sophomore year, working again during the second summer. Beginning with the third year, students alternate be tween employer and classroom each semester for the next two years, return to the classroom for the fifth and final year. An alternate method is to work a full academic year and then return to school. Schedules for transfer students

arranged on an individual basis according to the number of credit hours ferred and the employer's requirements.

Arrangements have been made or are in progress with many businesses, indus- organizations, and governmental agencies for employment opportunities. cooperative job opportunities, however, are available for the summer just to the freshman year.

tion Aid

der the Tuition Aid Program offered by certain employers, up to 50 per- of the cost of tuition, textbooks, and fees (exclusive of room and board) e granted on request. If tuition assistance is received, the cooperative stu- may have to agree to serve as a government civilian employee after grad- for a period to be determined by regulations in effect at that time. As a rvice employee, the co-op student is eligible for many federal benefits, ding annual leave, sick leave, paid holidays, health benefits, and life in- ce

plications

plications for the Cooperative Education Program from registered or r students should be submitted at least six weeks prior to the beginning first work period. It is recommended, however, that applications be sub- four months in advance of the work period. Transfer students who meet ion requirements may apply for a work assignment during the summer mester just prior to their registration at this University.

DERGRADUATE DUAL-DEGREE PROGRAMS WITH HAMPTON NSTITUTE, BOWIE STATE COLLEGE, AND VIRGINIA OMMONWEALTH UNIVERSITY

School of Engineering and Applied Science, Hampton Institute, Bowie College, and Virginia Commonwealth University, all of which are ac- ed four-year degree-granting institutions, have established a dual-degree am that joins general education and career education in a unique and rehensive experience. This program is in addition to the engineering pro- already offered on the campus at George Washington University.

Hampton Institute, Bowie State College, and Virginia Commonwealth Uni- (VCU) offer several four-year degree programs in a variety of disci- To provide opportunity for careers in engineering, Hampton Institute, State College, and VCU joined with the School of Engineering and d Science, which offers accredited four-year programs in engineering.

dents enrolled in the dual-degree program first follow a general plan of for three years at Hampton Institute, Bowie State College, or VCU. This am is based on the social sciences, humanities, and the preparatory back- d engineering courses in mathematics, physics, and chemistry, which help op broad cultural perspectives, analytic abilities, and communication

After successful completion of the first phase of study, students then fol a two-year career program in engineering at the School of Engineering Applied Science. During this phase of the study, students may specialize any of the following areas of engineering, which are also offered in Geo Washington University's regular four-year programs:

1. Civil Engineering, or the following option: Geotechnical Civil Engine ing.

2. Electrical Engineering, or the following options: Computer Science, P medical Engineering.

3. Mechanical Engineering, or the following options: Energy Resources a Power, Computer-oriented Mechanical Engineering.

4. Operations Research and Computational Science.

Some of the advantages of the dual-degree program follow.

Students may begin their education at Hampton Institute, Bowie State C lege, or VCU and then obtain a B.S. in an engineering area from George Wa ington University. This unique academic background provides the student w many options in choosing a profession upon graduation. The student may into engineering practice, continue study for advanced degrees, or enter oth professional areas such as law, medicine, or teaching.

Dual-degree students, while at Hampton Institute, may participate in th Summer Training Program. In this program, students may work for a 12-wee period during the summer at the Joint Institute for Advancement of Flig Sciences at the National Aeronautics and Space Administration's (NASA Langley Research Center in Hampton, Va., obtaining valuable work experienc in a first-rate laboratory while earning funds for the following academic yea This program may be made available to some prefreshmen who desire to wor upon graduation from secondary school.

Dual-degree students may avail themselves of summer employment throug the George Washington University's Cooperative Education Program in Eng neering prior to their actual attendance at George Washington University.

In George Washington University's Cooperative Education Program in Eng neering (see pages 42–45), a student may work summers and one or two aca demic semesters and earn sufficient funds to help pay expenses while obtainin valuable engineering experience.

The dual-degree program offers the student time to become acclimated t college life and study at a reasonable cost while preparing for an exciting a rewarding profession.

For further information write or call Dean of Admissions and Registrar Hampton Institute, Hampton, Va. 32668, Phone (804) 727-5328 or 727-5329 or Mr. Johnny W. Ponds, Mathematics Department, Bowie State College Bowie, Md., 20715, Phone (301) 262-3350; or Prof. William Sloope, VCU Phone (804) 257-1313; or Manager, Engineering Admissions, School of Engineering and Applied Science, George Washington University, Washington D.C. 20052, Phone (202) 676-6158.

CONTINUING ENGINEERING EDUCATION PROGRAM

Today most engineers and their employers are well aware of the rapid advances of knowledge in science and technology. The inability to understand and to apply new technologies can mean both personal and corporate failure. To prevent this potential obsolescence, engineers must involve themselves in a continuing program of technical reading and organized learning.

The School of Engineering and Applied Science meets this need with a comprehensive program of noncredit courses. The program's objective is to increase the competence of practicing engineers rather than to grant further academic degrees. Staff reorganizations require many engineers to change their specialties or to take on additional duties within their present jobs. Continuing engineering education can provide the education and skills the engineer needs to effectively make these changes. Continuing Engineering education also aids in qualifying for promotions and in maintaining certification in certain professional fields.

The program will present about 400 noncredit courses this year. About half of them last for five days (30 classroom hours), while others are for two, three, or four days. Some courses are presented in the evening (two-hour sessions once a week for 8 to 12 weeks), or on Saturday morning. Presentation of theory is often augmented by workshops to give registrants practice in the specific discipline. All courses stress practical applications. Students from all over the nation and from many foreign countries have participated in courses. The variety of experience and background of these students enriches the classroom discussions.

Subjects which have been presented in this program include:

Electronics/Communications/ Computers
Modern Algorithms for Estimation and Control
The Automated Office: Systems and Technology
Advances in Electronic Technology
CCD and SAW Devices for Communications, Radar and Signal Processing
Computer Graphics
Computer Programming for the Non-Programmer
Command and Control Systems
Computer-Aided Preliminary Ship Design
Computer Output Microfilm
Computer Cryptography
Computer Performance Evaluation
Computer Memories and Storage Devices
Computer Security
Communication Systems
Configuration Management of Software Programs
Data Base Management
Data Communications
Digital Communications
Digital Electronics for Non-Electrical Engineers
Digital Satellite Systems
Digital Signal Processing
Distributed Processing
ECM and ECCM for Digital Communications
Effective Computer Operations Management
Electrical Controls for Power Systems
Electric Power System Design
Electrical Equipment Maintenance
Electromagnetic Compatibility
Fiber and Integrated Optics
Integrated Circuits
Industrial, Scientific, and Medical Applications of Microwaves
Lightning Protection
Magnetic Bubble Memory
Management of Research and Development

Microcomputers in Control Systems
Microprocessors and Microcomputers
Minicomputers
Microfilm Information Systems
Mini/Microcomputers for Non-Electrical Engineers
Optical Signal Processing
Optics in Radar
Phase Locked Loops
Practical Digital Design
Practical Electronics
Millimeter Wave Space Communications
Radar Systems
Protective Relaying for Power Systems
Radar Signal Processing
Remote Sensing and Digital Information Extraction
Satellite Communications
Simplified Math for Electronics Applications
Sonar Signal Processing
Sonar Systems
Small Computer Systems
Small Computers for Business and the Professions
Space Communications and Systems
Spread Spectrum Communications
Structured Programming
Telecommunications
Telephone Equipment Registration for PBX and KTU Interconnection

Mathematical Methods in Engineering
Analysis of Variance
Applied Numerical Methods
Applied Statistical Theory
Biomedical Statistics
Fault Tree Analysis
Finite Element Method
Forecasting Techniques
Nonparametric Statistics
Operations Research
Tools for the Data Analyst
Working Statistics for Engineers

Program and Cost Management
Configuration Management
Design-to-Cost
Life Cycle Costing
Management of Project Documentation
Management Skills for Engineers and Scientists
Managerial Decision Making
Project Management
R and D Management

Safety and Reliability
Mechanical Reliability
Reliability of Nuclear Power Plants
Reliability in the Biomedical Sciences
System Safety
Managing Hospital Risk
OSHA

Medical Engineering
Intensive and Coronary Care Units
Clinical Engineering Management
Biomedical Equipment in Health Care Facilities
Maintenance Management of Medical Instrumentation
Surgical Operating Suites

Environment and Energy
Air Pollution Control Equipment
Energy Conservation
Bioassay Aspects of the NPDES Permit
Energy Forecasting
Environmental Impact Statements
Fluidized-Bed Combustion
Heat Pipe
Industrial Noise Control
Solar Heating and Cooling
Temperature Control Systems

Materials/Structures/Construction
Material Failure, Analysis and Prevention
Metal Fracture and Fatigue
Highway and Railway Bridges: Evaluation and Upgrading

General Courses
Oceanography and Meteorology
Patent Law for Engineers and Scientists
Writing Technical Communications
Report Writing Workshop
Standards and Calibration Labs

ew courses are developed as needs become apparent in various fields, and ated courses are continuously revised. Over 80 new courses were added last r.

n addition to the faculty of the School of Engineering and Applied Science, nding lecturers and instructors from other universities, from industry, and m government laboratories and agencies serve on the instructional staff of program.

The program also offers noncredit contract courses off campus specifically red for the needs and background of the engineers employed by a company gency. Tuition for these courses is usually slightly lower than for those ed at the University.

To receive announcements or additional information on the program, write Continuing Engineering Education Program, School of Engineering and ied Science, George Washington University, Washington, D.C. 20052, or 202) 676-6106 or (800) 424-9773.

Administration

arold Liebowitz, D.Ae.E., *Dean of the School of Engineering and Applied cience; Co-director of the Joint Institute for Advancement of Flight Sciences; Director, Institute for the Study of Fatigue, Fracture, and Structural Reliability*

mes Elmer Feir, Ph.D., *Associate Dean of the School of Engineering and Applied Science*

li B. Cambel, Ph.D., *Chairman of the Department of Civil, Mechanical, nd Environmental Engineering; Director, Energy Programs*

erald Gross, Ph.D., *Chairman of the Department of Operations Research*

ymond Pickholtz, Ph.D., *Chairman of the Department of Electrical Engineering and Computer Science*

am Rothman, Ph.D., *Chairman of the Department of Engineering Administration*

William H. Marlow, Ph.D., *Director, Institute for Management Science and Engineering*

Ihan Wen Yuan, Ph.D., *Associate Director, Joint Institute for Advancement of Flight Sciences*

John Edward Duberg, Ph.D., *Director of the NASA-Langley Graduate Program; Director of the Joint Institute for Advancement of Flight Sciences*

alcolm P. Clark, M.S., *Administrator of the NASA-Langley Graduate Program*

William F. Shanahan, B.S., *Manager of Engineering Admissions and Cooperative Education Program*

John Lindsey Whitesides, Jr., Ph.D., *Assistant Director, Research and Education, Joint Institute for Advancement of Flight Sciences*

k Emerson Mansfield, B.S. in E.E., *Director of the Continuing Engineering Education Program*

Frederic A. Hooper, M.S., *Research and Resources Officer*

eorge Ellowitz, B.A., *Executive Associate to the Dean*

DEAN'S COUNCIL

Harold Liebowitz *(Chairman)*, R.R. Fox, T.G. Toridis, Henry Steiner

Advisory Council*

THE PURPOSES of the Advisory Council for the School of Engineering an Applied Science are to strengthen communication between the School and th other colleges, schools, and divisions of the University as well as between th School and the University's Board of Trustees; to advise on the programs o instruction, research, and service in the School and to help interpret these pro grams to the community and the nation; and to stimulate support for the con tinued development of the School and its programs.

MEMBERS OF THE COUNCIL FOR 1979–80

Chairman: Stephen R. Woodzell *(University Trustee), former President of th Potomac Electric Power Company*
Raymond L. Bisplinghoff, *Tyco Laboratory*
Bruno A. Boley, *Dean, Technological Institute, Northwestern University*
George M. Bunker, *President, Martin Marietta Corporation*
J.P. Chambers, *President, Melpar Division E-Systems, Inc.*
L. Stanley Crane, *President, Southern Railway System*
Joseph M. Fox, *Chairman, Lesco/Fox Associates, Inc.*
Moses Freedman, *Vice President, Blake Construction Company*
Eugene G. Fubini, *Engineering Consultant*
Martin Goland, *President, Southwest Research Institute*
William J. Harris, Jr., *Vice President, Research and Test Department, Asso ciation of American Railroads*
Alexander Hassan, *Washington, D.C.*
Walter R. Hibbard, Jr., *Professor, Virginia Polytechnic Institute, Blacksburg*
William Holt, *Carborundum Company, Niagara Falls, N.Y.*
William H. Marlow, *Professor, Department of Operations Research*
Coleman Raphael, *President, Atlantic Research*
Bernard A. Schriever, General USAF (Ret.), *Chairman of the Board Schriever & McKee Associates, Inc.*
Arthur W. Sloan, *Chief Executive Officer, Susquehanna Corporation*
Wayne G. Shaffer, *President, Vitro Corporation*
Edward G. Uhl, *President, Fairchild Industries, Inc.*
Ernst Weber, *Chairman, Division of Engineering, National Research Council*
Harold A. Wheeler, *Chief Scientist and Chairman, Hazeltine Corporation*
James F. Young, *Vice President—Engineering, General Electric Company*
L.A. Zadeh, *Chairman, Department of Electrical Engineering and Computer Sciences, University of California, Berkeley*

* The President of the University, the Vice President for Academic Affairs, and the Dean of the School of Engineering and Applied Science are *ex officio* members of the Advisory Council

PROGRAMS OF STUDY AND COURSES OF INSTRUCTION

IN THE FOLLOWING PAGES are listed programs of study, curricula, and courses instruction offered by the School of Engineering and Applied Science.

Students who are not candidates for degrees but who wish to take courses ered by the School should apply for admission to the Division of University dents.

EXPLANATION OF COURSE NUMBERS

ourses numbered from 1 through 199 are planned for undergraduate credit, hough certain courses may be taken for graduate credit when arrangements approved in advance by the instructor and the Dean. Courses numbered to 300 are planned for graduate credit and may in certain instances be en by qualified undergraduate students. Courses numbered from 301 to are primarily for doctoral students.

MESTER HOURS OF CREDIT

e number of semester hours' credit given for the satisfactory completion of urse is indicated in parentheses after the name of the course. Thus, a year se giving three hours of credit each semester is marked (3–3), and a ester course giving three hours' credit is marked (3). A semester hour con- of the completion of one 50-minute period of class work or of one lab- tory period a week for one semester.

ME OF COURSE OFFERINGS

llowing each course description is a parenthetical statement listing the semes- or which the course is scheduled to be offered. The term "academic year" is only with two-semester courses, and indicates that the first half of the rse is to be offered in the fall semester and the second half in the spring ester; the term "as arranged" is used for courses which could not be duled at the time of printing this catalogue. Offerings for the summer sions are not designated in this catalogue. Students should consult the mer *Sessions Schedule of Classes* for summer offerings. A *Schedule of* ses is also published for each fall and spring semester which provides up-to- information concerning the time of course offerings.

KEY TO ABBREVIATIONS

The following abbreviations for course designations are used by George Washington University.

Acct	Accounting
AmCv	American Civilization
Anat	Anatomy
Anes	Anesthesiology
Anth	Anthropology
ApSc	Applied Science
Art	Art
ArTh	Art Therapy
Bioc	Biochemistry
BiSc	Biological Sciences
BAd	Business Administration
Cart	Cartography
Chem	Chemistry
CH&D	Child Health and Development
Chin	Chinese
CE	Civil Engineering
Clas	Classics
ClEn	Clinical Engineering
CSci	Computer Science
Derm	Dermatology
Econ	Economics
Educ	Education
EPol	Education Policy
EE	Electrical Engineering
EAd	Engineering Administration
EngS	Engineering Science
Engl	English
EFL	English as a Foreign Language
EnHe	Environmental Health
Envr	Environmental Studies
Hum	Experimental Humanities
ForS	Forensic Sciences
Fren	French
Gnet	Genetics
Geod	Geodesy
Geog	Geography and Regional Science
Geol	Geology
Geop	Geophysics
Ger	Germanic Languages and Literatures
Gern	Gerontology
HCA	Health Care Administration
HCS	Health Care Sciences
Hist	History
HKLS	Human Kinetics and Leisure Studies
Idis	Interdisciplinary Courses
IAf	International Affairs
Ital	Italian
Japn	Japanese
Jour	Journalism
Law	Law
LEnf	Law Enforcement
Mgt	Management Science
Math	Mathematics
ME	Mechanical Engineering
M&PA	Medical and Public Affairs
Med	Medicine
Micr	Microbiology
MStd	Museum Studies
Mus	Music
NSur	Neurological Surgery
Neur	Neurology
Ob&G	Obstetrics and Gynecology
Ocea	Oceanography
OR	Operations Research
Opth	Ophthalmology
Oral	Oral Biology
Orth	Orthopedic Surgery
Otol	Otolaryngology
Path	Pathology
Phar	Pharmacology
Phil	Philosophy
Phys	Physics
Phyl	Physiology
PSc	Political Science
Port	Portuguese
Pchi	Psychiatry and Behavioral Sciences
Psyc	Psychology
PAd	Public Administration
Rad	Radiology
Rel	Religion
SLP	Service Learning Program
Slav	Slavic Languages and Literatures
Soc	Sociology
Span	Spanish
SpEd	Special Education
SpDr	Speech and Drama
Stat	Statistics
Surg	Surgery
TCom	Telecommunication Operations
U&RP	Urban and Regional Planning
Urol	Urology
WStu	Women's Studies

erdepartmental offerings.

NDERGRADUATE COURSES

57 Analytical Mechanics I (2)

First half of a one-year sequence. Concepts of statics, including force systems, equilibrium conditions, simple structures, distributed forces, shear and moments, friction and the concept of work, virtual work and stability. Prerequisite or concurrent registration: ApSc 113, Phys 14. (Fall and spring)

58 Analytical Mechanics II (3)

Second half of a one-year sequence. Concepts of dynamics, including kinematics of particles, velocity and acceleration, Newton's laws of motion, momentum, work, kinetic energy, potential energy, central force fields, vibrations, resonance, dynamics of systems of particles, kinematics of a rigid body, dynamics of a rigid body. Prerequisite: ApSc 57. (Fall and spring)

113 Engineering Analysis I (3)

Analytical methods appropriate to the solution of engineering problems, including applications of ordinary differential equations, matrices and determinants, eigenvalues and eigenvectors, systems of ordinary linear differential equations, Bessel and Legendre functions. Prerequisite: Math 33. (Fall and spring)

114 Engineering Analysis II (3)

Analytical methods appropriate to the solution of engineering problems, including complex variables, Fourier series and integral, orthogonal functions, Laplace transforms, partial differential equations in engineering and applied science. Prerequisite: ApSc 113. (Fall and spring)

115 Engineering Analysis III (3)

Solution of engineering problems using concepts from probability and statistics, including random variables, distribution functions, mathematical expectation, point and confidence interval estimation, hypothesis testing, correlation, and regression. This methodology applied to problems of structural design, bioengineering, manufacturing processes, product quality, equipment reliability, engineering management, and societal engineering. Prerequisite: Math 32. (Fall and spring)

116 Engineering Analysis IV (3)

Solution of engineering problems using advanced concepts from probability and statistics applied to problems of engineering design, bioengineering, production processes, engineering management, and societal engineering. Prerequisite: ApSc 115. (Fall and spring)

GRADUATE COURSES

211 Analytical Methods in Engineering I (3)

Engineering applications of the theory of complex variables including contour integration, conformal mapping, inversion integral, and boundary-value problems. Prerequisite: approval of Department. (Fall and spring)

212 Analytical Methods in Engineering II (3)

Analytical methods appropriate to the formulation of engineering problems including finite dimensional vector spaces, eigenvalue problems, generalized Fourier series, tensor calculus, curvilinear coordinates. Prerequisite: approval of Department. (Fall)

213 Analytical Methods in Engineering III (3)

Analytical techniques for solution of boundary-initial value problems in engineering involving wave propagation, diffusion processes, and potential distributions. Prerequisite: approval of Department. (Fall and spring)

214 Analytical Methods in Engineering IV (3)

Introduction to variational methods in engineering including Ritz and Galerkin approximation methods of boundary-value problems. Aspects of linear integral equations arising from engineering analysis. Prerequisite: approval of Department. (Spring)

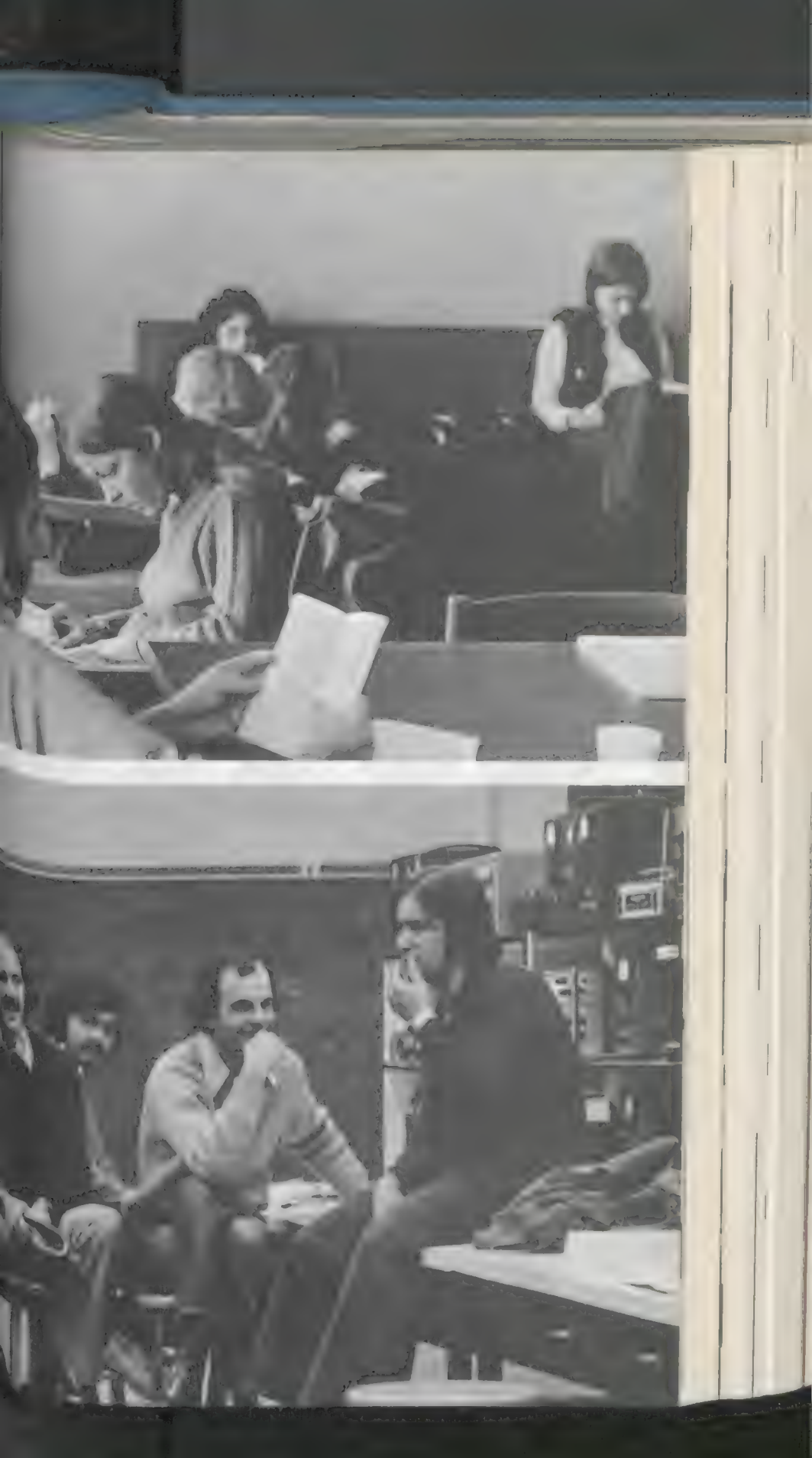
215 Analytical Methods in Engineering V (3)

Advanced methods of solution of boundary-initial value problems in engineering, including characteristics, wave propagation, and Green's functions. Prerequisite: ApSc 213. (Fall)

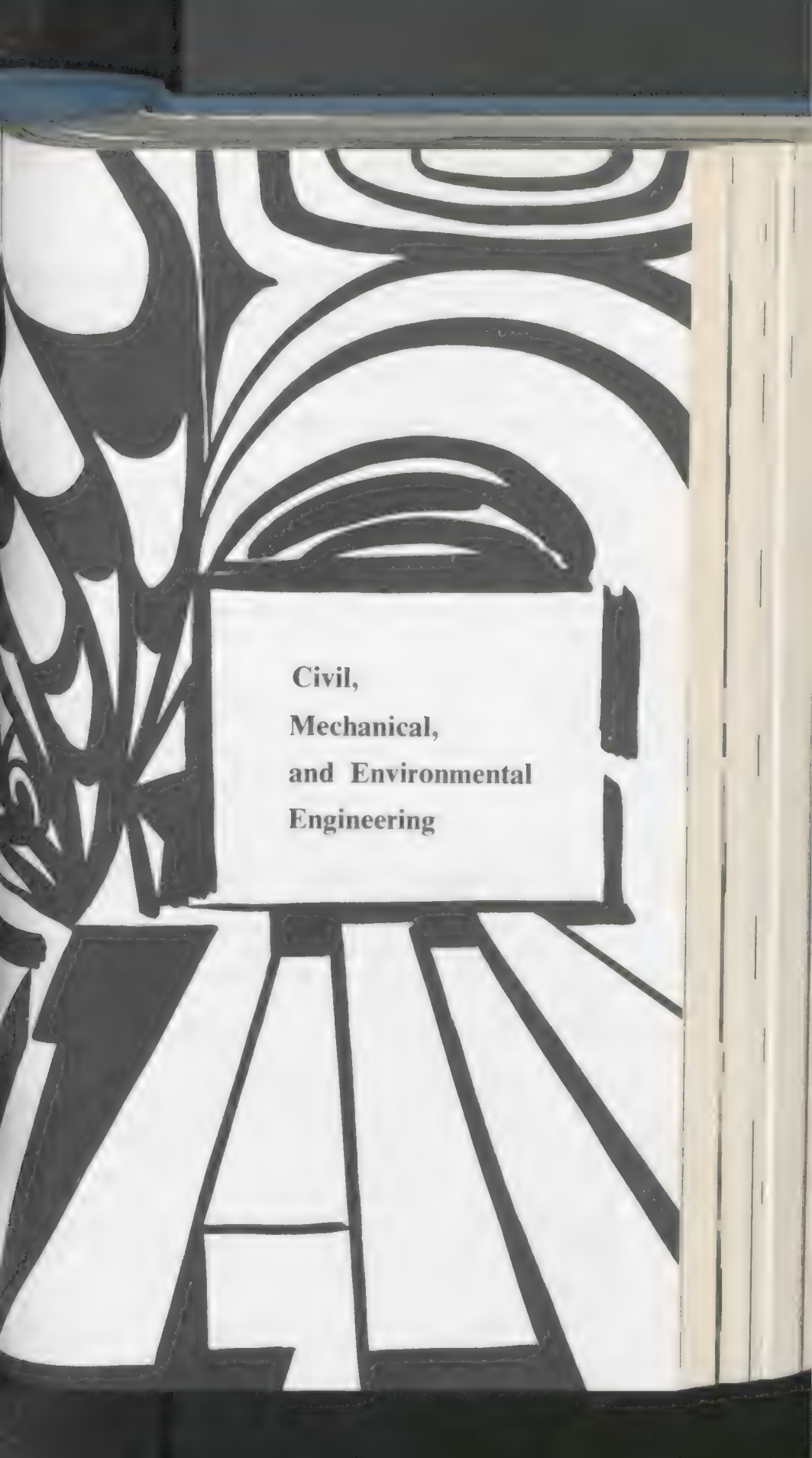
216 Special Topics in Engineering Analysis (3)

Selected topics such as (1) perturbation techniques applied to approximate solution of nonlinear boundary and initial value problems in engineering, (2) application of singular integral equations in problems of mechanics, (3) applications of elements of functional analysis in engineering and science. Prerequisite: approval of Department. (Spring, even years)





KOUROS


Civil,
Mechanical,
and Environmental
Engineering

Civil, Mechanical, and Environmental Engineering

Professors G.M. Arkilic, R.R. Fox, H. Liebowitz, S.W. Yuan, J. Foa, J.E. Fe
T.G. Toridis, J.P. Campbell *(Research)*, J. Eftis, A.K. Noor, R. Goulard
A.B. Cambel *(Chairman)*, K. Mahmood, A.M. Kiper, M.K. Myers, J.
Yang, R.E. Kaufman

Adjunct Professors J.E. Duberg, B.L. Clarkson, R.M. Sorensen, W.P. Rei
T.P.G. Liverman

Professorial Lecturers R.E. Fulton, M.P. Gaus, M.J. Queijo, J.B. Scalzi, P. Do
ely, L.K. Loftin, Jr., L. Divone, L.G. Herman, M. Yachnis, W. Viessman, J
K.H. Jones, W.D. Erickson, J.A. Belding, Jr., N.L. Basdekas, B. Whang, M.
Ojalvo, J. Morgan, Y. Gordon, J. Weggel, T.F. Zien, D. Michel, A. Koth

Associate Professors D.L. Jones, J.L. Whitesides, Jr., C. Gilmore, B. Bell,
Runyan, Jr., *(Research)*, D.M. Esterling *(Research)*, B.R. Barkstrom *(Re*
search), V. Klein *(Research)*, J.D. Lee *(Research)*, F. Farassat *(Research*

Adjunct Associate Professor B.W. Hannah, A.K. Trehan

Associate Professorial Lecturers R.W. Fralich, E.C. Yates, Jr., J. Sobieski, M
Stein, R.W. Barnwell, T.M. Walsh, P.B. Buck, E.F. Skelton, H.A. Leybold
A.G. Adamantiades, J. Ettinger, H.E. Bethel, E. Glynn, P.L. Coe, Jr., C.
Jachimowski, M.C. Cullingford, D. Feit, R. McConnell, J.C. Hardin, D.S
Tenney, H.S. Lew, G.D. Love, A.M. Yen, D.R. Levin, J.C. Yu, R.Y. Ting,
S.C. Liu, A. Kehnemui, E. Long, Jr., S.K. Park, J.N. Shoesmith, H. Singh, J
Tracy, D. Gubser, W. Kennis, S. Leighton, D. Ellison

Assistant Professors P. Ko, K. Khozeimeh *(Research)*, R.K. Kao *(Research)*
P.K. Poulose *(Research)*

Assistant Professorial Lecturers I.E. Beckwith, R.L. Bowles, J.B. Robertson
R.C. Montgomery, D. Mulville, M. Rozansky, W.J. Boettinger, C. Ng, H.L.
Beach, Jr., D.D. Loendorf, G.D. Walberg, D.L. Dwoyer, B.A. Stein, D.
Brewer, G.L. Smith, M. Furman.

Lecturer R. Lee

CIVIL ENGINEERING—UNDERGRADUATE STUDY

Civil engineering encompasses those branches of engineering activities most closely related to the control and improvement of our environment and of the conditions of life. Study in this field prepares students for careers in the planning, design, and construction of buildings; bridges; roads; airports; rapid transportation systems; harbors; off-shore facilities; coastal protection structures; flood and pollution control systems for rivers, estuaries, and lakes; inland navigation systems; large power generation and flood control dams; water resources projects; urban renewal and development projects; and pollution control and waste disposal projects. It also provides the scientific and technological

background required for careers in municipal engineering, urban and regional planning, and environmental and geotechnical civil engineering; and for careers in engineering research in structural mechanics, ocean engineering, and materials engineering.

The curriculum provides the essentials for beginning a career upon graduation for registration as a professional civil engineer as required by law, and for continuing study at the graduate level.

Evening Classes

In response to requests from those employed full time in the Washington, D.C., area who wish to obtain a Bachelor of Science degree in Civil Engineering in a reasonable period of time, evening classes in the Civil Engineering curriculum are scheduled on a regular basis. For example, if a part-time student enrolls for three courses a semester, B.S. degree requirements can be completed in less than 15 semesters.

Core Curriculum

Normally the first four semesters are common to all undergraduate fields in the School of Engineering and Applied Science.

First Semester

EE 51:	Applications of Computers (3)
Math 30–31:	Precalculus and Single-Variable Calculus I (3)*
or	
Math 31:	Single-Variable Calculus I (3)
Phys 3:	Foundations of Physics (3)
Engl 9 or 10:	English Composition: Language as Communication (3)
Elective:	Selected from humanities or social sciences (3)

Second Semester

EngS 4:	Descriptive Geometry and Drafting (3)
Math 32:	Single-Variable Calculus II (3)†
Math 33:	Multivariate Calculus (3)†
Phys 14:	Introductory Mechanics and Thermal Physics (3)
Elective:	Selected from humanities or social sciences (3)

Third Semester

ApSc 57:	Analytical Mechanics I (2)
ApSc 113:	Engineering Analysis I (3)
ApSc 115:	Engineering Analysis III (3)

*Transfer students who have not successfully completed a college-level calculus course with a grade of B or better from an accredited institution, or high school students who did not take an advanced placement (AP) calculus course and receive a score of 4 or 5 on the AP test, will be required to take a one-hour locally administered math placement test at registration. This test covers algebra, trigonometry and graphs. Students who do not place directly into Math 31 as a result of this test will be required to undertake a combined pre-calculus and calculus course (Math 30–31) during their first semester; this combined course meets five hours per week and carries three semester hours of credit if the student successfully completes the second half (Math 31) of the combined course.

†Math 32 and Math 33 may be taken in a one-semester combined course, Math 32–33.

Chem 13:	General Chemistry (4)
Phys 15:	Elements of Electricity and Magnetism (3)
Elective:	Selected from humanities or social sciences (3) (May be taken during the Summer Sessions)

Fourth Semester

ApSc 58:	Analytical Mechanics II (3)
ApSc 114:	Engineering Analysis II (3)
CE 120:	Introduction to Mechanics of Solids (3)
CE 140:	Materials Science (3)
Phys 16:	Introduction to Modern Physics (3)

Civil Engineering Curriculum

Fifth Semester

CE 110:	Introduction to Environmental Engineering (3)
CE 121:	Structural Theory I (3)
CE 166:	Materials Engineering (2)
CE 167:	Mechanics of Materials Laboratory (1)
ME 131:	Thermodynamics (3)
Elective:	Selected from humanities or social sciences (6)

Sixth Semester

CE 122:	Structural Theory II (3)
CE 190:	Legal and Economic Aspects of Engineering (2)
CE 192:	Reinforced Concrete Structures (3)
Geol 136:	Engineering Geology (3)
ME 126:	Fluid Mechanics (3)
Elective:	Selected from humanities or social sciences (3)

Seventh Semester

CE 168:	Introductory Soil Mechanics (3)
CE 191:	Metal Structures (3)
CE 193:	Hydraulics (3)
CE 194:	Environmental Engineering I: Water Supply and Resources (3)
CE 195:	Hydrology (3)
Elective:	Technical electives (3)

Eighth Semester

CE 182:	Foundation Engineering (2)
CE 185:	Soil Mechanics and Foundation Engineering Laboratory (1)
CE 196:	Design and Cost Analysis of Civil Engineering Structures (3)
CE 197:	Environmental Engineering II: Waste and Pollution Control (3)
Elective:	Technical electives (5)

Technical Electives

CE 198:	Research (3)
CE 201:	Design of Metal Structures (3)
CE 202:	Design of Reinforced Concrete Structures (3)
CE 203:	Prestressed Concrete Structures (3)

CE 204: Applied Soil Mechanics I (3)
CE 206: Foundation Engineering (3)
CE 208: Rock Mechanics (3)
CE 210: Methods of Structural Analysis (3)
CE 213: Hydraulic Structures (3)
CE 214: Design of Dams (3)
CE 215: Urban Construction Technology (3)
CE 216: Advanced Hydrology (3)
CE 220: Urban Transportation Engineering (3)
CE 222: Stations and Terminals (3)
CE 223: Traffic Engineering (3)
CE 240: Environmental Microbiology (3)
CE 241: Environmental Chemistry (3)
CE 243: Environmental Impact Assessment (3)
CE 253: Failure and Reliability Analysis of Engineering Structures (3)
CE 255: Coastal Processes (3)
CE 266: Design Procedures for Earthquakes (3)
CE 282: Hydraulic Modeling (3)
EAd 150: Introduction to Engineering Administration (3)
EngS 215: Advanced Strength of Materials (3)
EngS 234: Composite Materials (3)
EngS 242: Materials Recycling and Recovery (3)
EngS 282: Computer-aided Design (3)



Geotechnical Civil Engineering Option

Geotechnical civil engineering encompasses engineering problems involving soil mechanics, foundation engineering, rock mechanics, and geological aspects of engineering. More specifically, planning, designing, and erecting structures founded on or made of soil and rock constitute the main features of this branch of civil engineering. Included are the design and construction of foundations for all types of buildings, bridges, and highway and airfield pavements; design and construction of earth- and rock-fill dams, embankments, waterfront structures, tunnels, and drainage facilities; and stabilization procedures for reclamation of marginal lands. Engineering geology, which is the application of geological data, principles, and interpretations to naturally occurring earth and rock masses, constitutes an important part in the planning and design stages of civil engineering structures of the above type. The Geotechnical Civil Engineering option provides the student with the fundamentals for subsequent growth and development in this branch of civil engineering.

CURRICULUM

Prerequisite: first four semesters as described in the Core Curriculum, see page 59, with the following changes:

Third Semester: *Geology 21 *Physical and Evolutionary Geology* (3) will be taken instead of the elective.

Fourth Semester: *Geology 122 *Structural Geology* (3) will be taken instead of CE 120: *Introduction to the Mechanics of Solids* (3). A 3-credit elective in the social sciences or humanities should also be taken at this time.

Fifth Semester

CE 120:	Introduction to the Mechanics of Solids (3)
CE 121:	Structural Theory I (3)
ME 131:	Thermodynamics (3)
CE 166:	Materials Engineering (2)
CE 167:	Mechanics of Materials Laboratory (1)
Elective:	Selected from humanities or social sciences (3)

Sixth Semester

CE 122:	Structural Theory II (3)
ME 126:	Fluid Mechanics (3)
CE 190:	Legal and Economic Aspects of Engineering (2)
CE 192:	Reinforced Concrete Structures (3)
*Geol 128:	Geomorphology (3)
*Geol 136:	Engineering Geology (3)

Seventh Semester

CE 168:	Introductory Soil Mechanics (3)
CE 191:	Metal Structures (3)
CE 193:	Hydraulics (3)
CE 195:	Hydrology (3)
*Geol 163:	Sedimentation (4)
*Geol 189:	Geophysics for Geologists (3)

* For Chemistry, Geology, and Microbiology course descriptions, see the *Undergraduate and Graduate Bulletin*.

Eighth Semester

CE 182:	**Foundation Engineering (2)**
CE 185:	Soil Mechanics and Foundation Engineering Laboratory (1)
CE 204:	Applied Soil Mechanics I (3)
*Geol 195:	Field Work (2)
Electives:	Selected from humanities or social sciences (6)

Civil Engineering Undergraduate Courses

110 Introduction to Environmental Engineering (3)

An introductory study of environmental resources and their uses. Aspects considered will include water resource systems; air and water quality; solid waste and wastewater disposal systems; noise pollution; treatment processes; environmental impact analysis and environmental planning. Prerequisite: Chem 13. (Fall)

120 Introduction to the Mechanics of Solids (3)

Three-dimensional strain and stress. Constitutive equations for elastic, viscoelastic, and plastic materials. Axial load, bending and torsion of struts and beams. Instability and failure. Prerequisite: ApSc 57 and 113. (Fall and spring)

121–122 Structural Theory I-II (3–3)

Theory of determinate and indeterminate structures using both classical and modern approaches. Prerequisite or concurrent registration: CE 120. (Fall and spring)

140 Materials Science (3)

Electron structure of atoms; atomic and molecular bonding; energy bands; crystal structure; imperfections; noncrystalline solids; reaction rates; diffusion; transport phenomena—thermal conductivity, electrical conduction; metals, insulators, semiconductors; magnetism. Prerequisite: Chem 13; concurrent registration: Phys 16. (Fall and spring)

166 Materials Engineering (2)

Mechanical properties and their description; effect of microstructure on the mechanical behavior of metals, ceramics, polymers, and polyphase materials; effect of strain-rate and temperature; creep, fatigue, and fracture; effect of surface and environment; materials evaluation for structural performance. Prerequisite: CE 140; concurrent registration: CE 120. (Fall and spring)

167 Mechanics of Materials Laboratory (1)

Measurement of strains and study of failure resulting from applied forces in ductile, brittle, anisotropic, elastomeric, plastic, and composite materials. Study of tension, compression, bending, impact and shear failures. Prerequisite or concurrent registration: CE 166. (Fall and spring)

168 Introductory Soil Mechanics (3)

Engineering properties of soils: analysis of lateral earth pressures, bearing capacity, foundations, and slope stability. Prerequisite: CE 120, ME 126. (Fall)

*Chemistry, Geology, and Microbiology course descriptions, see the *Undergraduate and Graduate*

182 **Foundation Engineering** (2)

Subsurface exploration, design of shallow foundations, design of pile foundations, earth-retaining structures. Prerequisite: CE 168. (Spring

185 **Soil Mechanics and Foundation Engineering Laboratory** (1)

Laboratory experiments for the classification, strength, compressibility and general engineering properties of soils. Prerequisite: CE 168. (Spring)

190 **Legal and Economic Aspects of Engineering** (2)

Laws relating to engineering practice, preparation of contract documents and specifications, consideration of economic factors in engineering design decisions. (Spring)

191 **Metal Structures** (3)

Principles of the design of metal structures; structural elements; connections; specific problems of analysis; methods of construction. Prerequisite: CE 122. (Fall)

192 **Reinforced Concrete Structures** (3)

Principles of the design of reinforced concrete structures. Details of reinforcement of structural elements. Monolithic structures, precast elements; methods of construction. Prerequisite: CE 121. (Spring)

193 **Hydraulics** (3)

Fluid statics: applications to calculation of boundary forces in a static fluid, buoyancy, and flotation. Application of kinematic principles; flow fields, stream tubes, and flow nets. Fluid dynamics: applications to pipe flow, hydraulic models, measurement of pressure, and velocity. Open-channel flow: applications to water resources engineering. Prerequisite: ME 126. (Fall)

194 **Environmental Engineering I: Water Supply and Resources** (3)

Planning and design of water supply and waste-water disposal systems. Water quality control and treatment processes. Desalination, stream pollution control. Prerequisite or concurrent registration: CE 193 (Fall)

195 **Hydrology** (3)

Descriptive hydrology: hydrologic cycle, precipitation, stream flow, evaporation, and transpiration. Quantitative hydrology: hydrograph analysis, estimating volume of runoff, runoff from snow, hydrographs of basin discharge, flow, storage routing. Probability concepts in hydrology: flood frequency, rainfall frequency, drought, stochastic hydrology. Prerequisite or concurrent registration: ApSc 115, ME 126, CE 193. (Fall)

196 **Design and Cost Analysis of Civil Engineering Structures** (3)

Design of civil engineering structures such as wharves, piers, bulkheads, tunnels, dams, bridges, water treatment, and drainage systems. Prerequisite: senior status. (Spring)

197 **Environmental Engineering II: Waste and Pollution Control** (3)

Disposal of sewage, biological treatment, chemical treatment, filtration, activated sludge, sludge handling and disposal. Control of industrial wastes and of nuclear waste products. Solid waste disposal. Prerequisite: CE 193. (Spring)

198 **Research** (1 to 3)

Applied research and experimentation projects, as arranged. Prerequisite: junior or senior status. (Fall and spring)

ECHANICAL ENGINEERING—UNDERGRADUATE STUDY

echanical engineering is primarily concerned with physical systems in mo- on. A mechanical engineer is concerned with the conversion, transfer, and ntrol of energy from its source to its moving system. Land and marine ve- les, transportation systems, air-conditioning systems, nuclear reactors and cells, low-pollution control devices, energy resources and the means of prac- and economical conversion of the various forms of energy to mechanical electrical power, and a host of other devices lie in this domain. Training this area should provide the ability to formulate problems based on funda- ntal laws of nature, to recognize the types of methods which are applicable their solution, to read with understanding the relevant work, and to come with a usable answer. The mechanical engineering curriculum provides a kground for careers in research, design, development, and manufacture in ide variety of industries.

Course offerings in mechanical engineering, which begin with a broad ndation in physics, chemistry, mathematics, humanities, and social sciences, nsist of studies in basic mechanics of solids and fluids, electricity and ctronics, material sciences, dynamic analysis, thermal sciences, energy con- rsion and power, environmental control, and the design of machines and tems and their control. Technical electives in the senior year allow students ested in computers to select an option which will prepare them for careers omputing as well as graduate study in computer-dominated or computer- nted professional fields. The program outlined below is based on the con- pt that the mechanical engineer must be prepared to meet the challenge of er-increasing technical, economic, and social problems.

raduates are qualified for professional positions in design, analysis, manu- ture, and application of machines, process, and control, or in research and elopment, as well as for graduate work.

ening Classes

response to requests from those employed full time in the Washington, D.C., who wish to obtain a Bachelor of Science degree in Mechanical Engineer- n a reasonable period of time, evening classes in the Mechanical Engineer- curriculum are scheduled on a regular basis. For example, if a part-time ent enrolls for three courses a semester, B.S. degree requirements can be pleted in less than 15 semesters.

ior Year Abroad Program

School of Engineering and Applied Science and the Institute of Sound and ration Research of the University of Southampton, England, have estab- ed an exchange program so that graduate students in acoustics at both insti- ons may transfer academic credits to either University in fulfillment of the

requirements for advanced degrees. A special arrangement has now been made to extend the graduate exchange program to the undergraduate level, enabling some mechanical engineering students to spend the junior year abroad.

The program furthers a student's particular academic interests in mechanical engineering and develops knowledge of world affairs in general, and international technical fields in particular.

Applicants must apply for admission to the Junior Year Abroad program to the Department Chairman before the end of the fall semester of the sophomore year. Approval must be given by the Department Chairman and the Dean of the School of Engineering and Applied Science.

Core Curriculum

Normally the first four semesters are common to all undergraduate fields in the School of Engineering and Applied Science.

	First Semester
EE 51:	Applications of Computers (3)
Math 30–31:	Precalculus and Single-Variable Calculus I (3)*
or	
Math 31:	Single-Variable Calculus I (3)
Phys 3:	Foundations of Physics (3)
Engl 9 or 10:	English Composition: Language as Communication (3)
Elective:	Selected from humanities or social sciences (3)
	Second Semester
EngS 4:	Descriptive Geometry and Drafting (3)
Math 32:	Single-Variable Calculus II (3)†
Math 33:	Multivariate Calculus (3)†
Phys 14:	Introductory Mechanics and Thermal Physics (3)
Elective:	Selected from humanities or social sciences (3)
	Third Semester
ApSc 57:	Analytical Mechanics I (2)
ApSc 113:	Engineering Analysis I (3)
ApSc 115:	Engineering Analysis III (3)
Chem 13:	General Chemistry (4)
Phys 15:	Elements of Electricity and Magnetism (3)
Elective:	Selected from humanities or social sciences (3) (May be taken during the Summer Sessions)
	Fourth Semester
ApSc 58:	Analytical Mechanics II (3)
ApSc 114:	Engineering Analysis II (3)
CE 140:	Materials Science (3)
EE 11:	Linear Networks I (3)

* Transfer students who have not successfully completed a college-level calculus course with a grade of *C* or better from an accredited institution, or high school students who did not take an advanced placement (AP) calculus course and receive a score of 4 or 5 on the AP test, will be required to take a one-hour locally administered math placement test at registration. This test covers algebra, trigonometry, and graphs. Students who do not place directly into Math 31 as a result of this test will be required to undertake a combined pre-calculus and calculus course (Math 30–31) during the first semester; this combined course meets five hours per week and carries three semester hours credit if the student successfully completes the second half (Math 31) of the combined course.

† Math 32 and Math 33 may be taken in a one-semester combined course, Math 32–33.

Phys 16: Introduction to Modern Physics (3)
Elective: Selected from humanities or social sciences (3)
(May be taken during the Summer Sessions)

Mechanical Engineering Curriculum

Fifth Semester

CE 120: Introduction to the Mechanics of Solids (3)
CE 166: Materials Engineering (2)
CE 167: Mechanics of Materials Laboratory (1)
ME 131: Thermodynamics (3)
ME 134: Introduction to Vibration Analysis (3)
Elective: Selected from humanities or social sciences (3)

Sixth Semester

EE 20: Introductory Engineering Electronics (3)
EE 172: Control Systems (3)
ME 120: Methods of Engineering Experimentation (2)
ME 126: Fluid Mechanics (3)
ME 148: Thermodynamic Analysis (3)
Elective: Selected from humanities or social sciences (3)

Seventh Semester

ME 155: Compressible Fluid Flow (3)
ME 187: Heat Transfer Theory (3)
ME 190: Mechanisms, Analysis, and Synthesis (3)
ME 191: Mechanical Design (3)
Elective: Technical electives (6)

Eighth Semester

ME 152: Mechanical Engineering Laboratory (2)
ME 193: Engineering Systems Design (3)
ME 194: Energy Conversion (3)
Elective: Technical electives (6)

Technical Electives

CE 197: Environmental Engineering II: Waste and Pollution Control (3)
EAd 150: Introduction to Engineering Administration (3)
EAd 160: Introduction to Engineering Economic Analysis (3)
EngS 215: Advanced Strength of Materials (3)
*ME 176: Environmental Engineering Problems (3)
ME 192: Product Design and Process Engineering (3)
ME 215: Theory of Vibrations (3)
ME 221: Intermediate Fluid Mechanics (3)
ME 225: Turbomachinery I (3)
ME 237: Propulsion I (3)
ME 240: Kinematic Synthesis (3)
ME 247: Fluidics (3)

Technical Electives for Computer-oriented Mechanical Engineering Option

CSci 278: Analog and Hybrid Computers (3)
EE 152: Introduction to Digital Computers (3)
EE 157: Machine and Assembly Language Programming (3)

*required course which must be selected from the technical electives.

EngS 282: Computer-aided Design (3)
EngS 283: Application of Computer Graphics in Engineering (3)
EngS 284: Numerical Methods in Engineering (3)
*ME 176: Environmental Engineering Problems (3)

Technical Electives for Energy Resources and Power-orient
Mechanical Engineering Option

EE 177: Electrical Energy Conversion (3)
EngS 208: Energy Conservation (3)
EngS 214: Geothermal Energy (3)
*ME 176: Environmental Engineering Problems (3)
ME 224: Fundamentals of Combustion Engines (3)
ME 225: Turbomachinery I (3)
ME 237: Propulsion I (3)
ME 259: Solar Heating and Cooling Systems (3)
ME 260: Heating, Refrigeration, and Air Conditioning (3)
ME 283: Nuclear Reactor Engineering I (3)
ME 294: Wind Energy (3)

Mechanical Engineering Undergraduate Courses

120 **Methods of Engineering Experimentation** (2)

Acquisition and analysis of experimental data. Laws of modeling an simulation. Report formulation and presentation. Basic principles of va rious measuring instruments and sensors. Laboratory experiments, includ ing use of strain gages, oscilloscopes, various tranducers, etc. Introductio to basic experimental techniques related to dynamics, fluid flow, and thermal sciences. Prerequisite: CE 120, ME 131. (Spring)

126 **Fluid Mechanics** (3)

Fluid properties, regimes in fluid mechanics, fluid statics, fluid kinemati basic equations, one- and two-dimensional inviscid incompressible flow viscous incompressible flow, dimensional method. Prerequisite: ApSc 58 (Spring)

131 **Thermodynamics** (3)

Fundamental thermodynamic concepts, Zeroth law of thermodynamics and temperature measurements, work and heat, first law of thermodyn namics, properties of pure substances, first-law analysis of some thermo dynamic systems, second law of thermodynamics, reversibility, entropy second-law analysis of thermodynamic systems. Prerequisite or concurrent registration: ApSc 58. (Fall)

134 **Introduction to Vibration Analysis** (3)

Natural frequencies and response of single- and multiple-degree of free dom mechanical systems to dynamic loads. Effect of damping, transient and steady-state analysis. Prerequisite: ApSc 58. (Fall)

148 **Thermodynamic Analysis** (3)

Analysis of thermodynamic power and refrigeration cycles; thermody namics of mixtures of substances; properties of air-water vapor mixtures psychrometry and analysis of cooling tower and air-conditioning proc third law of thermodynamics and absolute entropy; evaluation of combus tion processes. Molecular distributions and models; introduction to sta

* Required course which must be selected from the technical electives.

tistical and quantum mechanics; statistical thermodynamics and thermodynamic properties of gases and solids. Prerequisite: ME 131. (Spring)

52 Mechanical Engineering Laboratory (2)

Experimental study of various engineering systems. Laboratory projects include experimental design, modeling and simulation parameters, data acquisition, and report presentation techniques. Prerequisite: ME 120. (As arranged)

55 Compressible Fluid Flow (3)

Introduction to compressible flow, basic equations, propagation of motion in compressible fluids, isotropic-flow relations, steady one-dimensional flow, wave phenomena, small perturbation theory, slender-body theory, method of characteristics. Prerequisite: ME 126, 131. (Fall)

56 Environmental Engineering Problems (3)

Classification and effects of air pollutants; air-quality criteria and standards; analysis of pollutants; sources of pollutants and emission inventory; emission-control equipment. Water-quality standards; sewage and industrial waste characterization and pollutional effects in natural waters; primary, biological, and tertiary treatment of wastes; sludge handling and disposal. Prerequisite: senior status. (Fall)

57 Heat Transfer Theory (3)

Heat transfer processes. General heat conduction equations; steady- and unsteady-state heat conduction problems. Methods of analysis; analytical, analog, and numerical solution methods. Fundamentals of convective-heat transfer. Evaluation of convective-heat transfer coefficients; dimensional analysis, boundary-layer approach, analogy between heat and momentum transfer. Energy exchange by thermal radiation; fundamental concepts and laws, radiation properties, radiative-heat transfer between surfaces. Design considerations; heat-exchanger design and selection. Prerequisite: ME 126. (Fall)

Mechanisms, Analysis, and Synthesis (3)

Kinematics and dynamics of mechanisms. Displacement, velocities, accelerations in linkage and cam systems by analytical and graphical methods. Prerequisite: ApSc 58. (Fall)

Mechanical Design (3)

Introduction to design concept, selection of materials, and strength of mechanical elements; design of machine components such as shafts, springs, bearings, gears, couplings, screws, and related mechanical components. Prerequisite: senior status. (Fall)

Product Design and Process Engineering (3)

Introduction to product design and to modern manufacturing techniques. Functional, technological, and economic considerations, such as production volume, energy and materials consumption, and labor. Criteria for product acceptance, cost, and other factors. Properties and behavior of metals and polymers. Capabilities and limitations of various basic and secondary processes and their influence on product design. Prerequisite: Senior status. (Spring)

Engineering Systems Design (3)

Creative engineering design, problem definition, and concept generation. Familiarization with standard machine components. Practice in integrat-

ing a variety of core disciplines via system design projects. Visual thi
ing, graphical communication, analysis and optimization techniq
Creative solutions to current, real engineering design problems. Des
projects may integrate with ME 152 Mechanical Engineering Laborato
projects. Prerequisite: ME 191. (Spring)

194 **Energy Conversion** (3)
Energy resources of the earth; energy, society, and the national economy
issue of energy and the environment, future outlook for energy supp
and demand. Conversion of energy; fundamental principles and techno
logical options, efficiency of different energy converters. Current tech
nologies and longer-range possibilities. Generation of electricity, trend
in the electricity industry; nuclear power systems -growth, economics, a
environmental impacts. Unconventional methods of power generation, d
rect energy conversion. Prerequisite: EE 20, ME 148. (Spring)

198 **Research** (1 to 3)
Applied research and experimentation projects, as arranged. Prerequ
site: junior or senior status. (Fall and spring)

ENGINEERING SCIENCE—UNDERGRADUATE COURSE

4 **Descriptive Geometry and Drafting** (3)
Introductory descriptive geometry. Use of equipment. Points, lines
curves, planes, and surfaces; principal, auxiliary, and orthographic view
isometric views, intersection of surfaces. Technical sketching, dimensio
and precision, machine elements. Detail and assembly drawings. Stru
tural elements. Layout and fabrication drawings, pipe and electric pro
(Spring)

GRADUATE STUDY

Developments in science and technology in the decades to come require that
the engineer be thoroughly grounded in fundamentals as well as in the new
emerging technological and scientific disciplines. The modern engineer must
also master techniques in analysis, computation, design, and synthesis. Amid
the proliferation of knowledge and technological specialty, the Department ad
heres to the principle that versatility and depth in scientific fundamentals shou
be the characteristic features of any graduate program that attempts to prepare
the student to cope with engineering developments.

The Department of Civil, Mechanical, and Environmental Engineering offers
graduate programs in the various areas of concentration on three degree levels:
the Master of Science degree, the Professional degree, and the Doctor of Science
degree.

The Doctor of Science degree is offered in the following areas: Acoustics;
Aeronautics; Energy, Resources, and Environment; Environmental and Water
Resources (except Option I, Environmental Engineering, which is for the
M.S. and Professional degrees only; and Option III, Water Resources Planning,
which is for the M.S. degree only); Fluid Mechanics and Thermal Sciences;
Hydromechanics and Ocean Engineering; Solid Mechanics and Materials
Engineering; Structural Engineering; Structures and Dynamics; and Transporta
tion Engineering (except Option III, which is for the M.S. and Professional
degrees only).

The Master of Science and the Professional degrees are offered in all of the aforementioned areas and in the following areas: Computer-aided Design, Environmental Modeling, Geotechnical Engineering, Mechanical Engineering Design, and Public Works Engineering.

Courses for these specializations are listed on subsequent pages. As part of the interdisciplinary program, students elect approved courses from other departments of the School of Engineering and Applied Science, as well as from other schools and divisions of the University. Depending upon the interest of the student, some of the programs leading to the degrees of Master of Science and, by special permission of the appropriate department chairman, Doctor of Science are given at the NASA-Langley Research Center, Hampton, Va. NASA-Langley's extensive scientific and engineering facilities and equipment are utilized whenever feasible.

Each program is arranged to fit the student's individual needs and interests and utilize previous experience and background. This background should normally include an undergraduate degree in engineering, the physical sciences, or applied mathematics. Each student is assigned a faculty adviser on the basis of study interests, enabling a close student-faculty relationship to develop during the course of the program.

Fields and Area of Concentration

Programs of study in any field of concentration will generally include courses from appropriate allied areas.

ACOUSTICS*

ApSc 211: Analytical Methods in Engineering I
ApSc 212: Analytical Methods in Engineering II
ApSc 213: Analytical Methods in Engineering III
ApSc 215: Analytical Methods in Engineering V
ApSc 216: Special Topics in Engineering Analysis
*EngS 203–4: Probability and Statistics of Metrology
EngS 217: Analytical Mechanics
EngS 270: Theoretical Acoustics I
*EngS 271: Random Process Theory I
*EngS 272: Random Process Theory II
*EngS 273: Time Series Analysis
EngS 274: Environmental Noise Control
*EngS 275: Theoretical Acoustics II
*EngS 276: Acoustical and Mechanical Measurements
*EngS 277: Physical Acoustics
*EngS 278: Psychological and Physiological Acoustics
*EngS 279: Human Factors in Engineering
*EngS 280: Special Topics in Acoustics
EngS 298: Research
EngS 299–300: Thesis Research
*EngS 310: Aeroacoustics
*EngS 311: Nonlinear Acoustics
*EngS 312: Theory of Random Vibration
*EngS 313: Structural Acoustics Interaction
EngS 398: Advanced Reading and Research
EngS 399: Dissertation Research

*Offered at NASA-Langley Research Center; may be offered on campus when arranged.

ME 215:	Theory of Vibrations
ME 216:	Structural Dynamics
ME 221:	Intermediate Fluid Mechanics
ME 312:	Theory of Turbulence

AERONAUTICS*

ApSc 211:	Analytical Methods in Engineering I
ApSc 212:	Analytical Methods in Engineering II
ApSc 213:	Analytical Methods in Engineering III
ApSc 214:	Analytical Methods in Engineering IV
ApSc 215:	Analytical Methods in Engineering V
ApSc 216:	Special Topics in Engineering Analysis
EE 202:	Linear System Theory I
EngS 217:	Analytical Mechanics
EngS 284:	Numerical Methods in Engineering
ME 215:	Theory of Vibrations
ME 221:	Intermediate Fluid Mechanics
ME 222:	Applied Fluid Dynamics
ME 223:	Aeroelasticity
ME 227:	Viscous Flow
ME 231:	Hydrodynamics
ME 235:	Compressible Flow
ME 237:	Energetics of Fluid Flow I
*ME 248:	Seminar: Aircraft Design I
*ME 249:	Seminar: Aircraft Design II
*ME 270:	Applied Fluid Dynamics
*ME 271:	VTOL Aircraft Technology
*ME 272:	Powered-lift Technology
*ME 273:	Principles of Automatic Flight Control
*ME 274:	Principles of Flight Guidance
ME 275:	Stability and Control of Vehicles
*ME 277:	Numerical Methods in Fluid Mechanics
*ME 278:	Performance, Stability, and Control of Helicopters
*ME 279:	Special Topics in Flight Sciences
ME 281:	Nonequilibrium Thermodynamics
*ME 290:	Kinetic Theory of Gases
ME 295:	Statistical Thermodynamics
ME 298:	Research
ME 299–300:	Thesis Research
ME 312:	Theory of Turbulence
ME 315:	Hypersonic Flow
ME 398:	Advanced Reading and Research
ME 399:	Dissertation Research

COMPUTER-AIDED DESIGN

ApSc 213:	Analytical Methods in Engineering III
CE 201:	Design of Metal Structures
CE 202:	Design of Reinforced Concrete Structures
CE 203:	Prestressed Concrete Structures
CE 210:	Methods of Structural Analysis
CE 250:	Advanced Metal Structures
CE 251:	Advanced Reinforced Concrete Structures
CE 252:	General Structural Dynamics
CE 254:	Special Topics in Structural Engineering
CE 261:	Analysis of Plates and Shells

* Offered at NASA-Langley Research Center; may be offered on campus when a[illegible]

CE 262: Design of Plate and Shell Structures
CE 263: Theory of Structural Stability
CSci 158: Algorithmic Methods and High-level Languages
CSci 201: Introduction to Computer Systems
CSci 208: Computer Programming
CSci 213: Discrete Structures in Computing
CSci 214: Data Structures
CSci 219: Interactive Computer Graphics
CSci 227: Management Information Systems and Data Base Management
S 251, 252: Transportation Workshop
EngS 282: Computer-aided Design
EngS 283: Application of Computer Graphics in Engineering
EngS 285: Finite Element Methods in Engineering Mechanics
EngS 288: Advanced Finite Element Methods in Structural Mechanics
ME 215: Theory of Vibrations
ME 216: Structural Dynamics
ME 218: Design of Floating and Submerged Marine Vehicles
ME 237: Energetics of Fluid Flow I
ME 238: Energetics of Fluid Flow II
ME 240: Kinematic Synthesis
ME 241: Engineering Systems Design
ME 242: Advanced Mechanisms
ME 243: Advanced Mechanical Engineering Design
ME 246: Electromechanical Control Systems
ME 247: Fluidics
ME 251: Advanced Electromechanical Control Systems

...ted courses for MS Degree: ApSc 213, CSci 201, 213, 214, EngS 282, and ... 219 or EngS 283.

...ERGY, RESOURCES, AND ENVIRONMENT

ApSc 211: Analytical Methods in Engineering I
ApSc 212: Analytical Methods in Engineering II
ApSc 213: Analytical Methods in Engineering III
ApSc 215: Analytical Methods in Engineering V
CE 243: Environmental Impact Assessment
EAd 221–22: Environmental Management
EAd 283: Systems Engineering I
EngS 206: Technology and Human Needs
EngS 207: Engineering Climatology
EngS 208: Energy Conservation
EngS 210: Quantitative Aspects of Social Phenomena
EngS 212: Nonrenewable Resources
EngS 213: Renewable Resources
EngS 214: Geothermal Energy
EngS 242: Materials Recycling and Recovery
EngS 270: Theoretical Acoustics I
EngS 274: Environmental Noise Control
EngS 284: Numerical Methods in Engineering
ME 204: Advanced Instrumentation Techniques
ME 221: Intermediate Fluid Mechanics
ME 224: Fundamentals of Combustion Engines
ME 225: Turbomachinery I
ME 226: Turbomachinery II
ME 227: Viscous Flow
ME 235: Compressible Flow
ME 237: Energetics of Fluid Flow I

ME 254:	Intermediate Heat and Mass Transfer
ME 257:	Energy Technology I
ME 258:	Energy Technology II
ME 259:	Solar Heating and Cooling Systems
ME 260:	Heating, Refrigeration, and Air Conditioning
ME 261:	Air Pollution I
ME 262:	Air Pollution II
ME 263:	Air Pollution Control Technology
ME 264:	Air Pollution Seminar
ME 265:	Air Pollution Meteorology
ME 280:	Intermediate Thermodynamics
ME 281:	Nonequilibrium Thermodynamics
ME 282:	Fossil Fuels
ME 283:	Nuclear Reactor Engineering I
ME 284:	Nuclear Reactor Engineering II
ME 287:	Heat Conduction
ME 290:	Kinetic Theory of Gases
ME 291–92:	Power Systems
ME 293:	Combustion
ME 294:	Wind Energy
ME 298:	Research
ME 299–300:	Thesis Research
ME 312:	Theory of Turbulence
ME 313:	Magnetofluidmechanics
ME 398:	Advanced Reading and Research
ME 399:	Dissertation Research
OR 201:	Survey of Operations Research Methods

Required courses for Degree Programs in Energy Technology (Option 1): MS—ApSc 211, 213, ME 221, 254, 257, 258, and 280; Professional Degree—EngS 284, ME 29[illegible] and 298; DSc—ApSc 212, 215 and ME 281.

Required courses for Degree Programs in Energy Systems (Option 2): MS—ApSc 213, ME 257, 258, 261, and OR 201; Professional Degree—EngS 284 and 298.

ENVIRONMENTAL AND WATER RESOURCES ENGINEERING

Option I: Environmental Engineering

ApSc 213:	Analytical Methods in Engineering III
Bioc 221:	General Biochemistry
CE 201:	Design of Metal Structures
CE 202:	Design of Reinforced Concrete Structures
CE 203:	Prestressed Concrete Structures
CE 211:	Physical and Chemical Wastewater Treatment
CE 212:	Open Channel Flow
CE 213:	Hydraulic Structures
CE 214:	Design of Dams
CE 216:	Advanced Hydrology
CE 219:	Groundwater and Seepage
CE 237:	Advanced Sanitary Engineering Design
CE 240:	Environmental Microbiology
CE 241:	Environmental Chemistry
CE 242:	Solid Waste Disposal
CE 243:	Environmental Impact Assessment

CE 272: Biological Wastewater Treatment
CE 273: Water Supply Engineering
CE 277: Industrial Waste Treatment
CE 278: Pollution Transport System
CE 279: Unit Operations in Environmental Engineering
CE 281: Special Topics in Water Resources
CE 282: Hydraulic Modeling
CE 298: Research
CE 299–300: Thesis Research
CE 310: Sedimentation Engineering
CE 311: Mechanics of Alluvial Channels
EAd 204: Administration of Engineering Contracts
EAd 210: Engineering Law
EAd 261: Economic Analysis in Engineering Planning
EngS 242: Materials Recycling and Recovery
EngS 260: Random Process Theory in Engineering
EngS 284: Numerical Methods in Engineering
ME 221: Intermediate Fluid Mechanics
ME 261: Air Pollution I
ME 262: Air Pollution II
ME 263: Air Pollution Control Technology
*Micr 211: Microbiology
*U&RP 204: Urban Development Planning

Required courses for MS Degree: CE 211, 212, 240, 241, 272 and 273.

Option II: Water Resources Engineering

ApSc 211: Analytical Methods in Engineering I
ApSc 213: Analytical Methods in Engineering III
ApSc 214: Analytical Methods in Engineering IV
ApSc 215: Analytical Methods in Engineering V
CE 208: Rock Engineering
CE 212: Open Channel Flow
CE 213: Hydraulic Structures
CE 214: Design of Dams
CE 216: Advanced Hydrology
CE 219: Groundwater and Seepage
CE 243: Environmental Impact Assessment
CE 255: Coastal Processes
CE 256: Introduction to Ocean and Coastal Engineering
CE 273: Water Supply Engineering
CE 274: Mechanics of Water Waves
CE 276: Water Resources Planning and Control
CE 278: Pollution Transport System
CE 279: Unit Operations in Environmental Engineering
CE 281: Special Topics in Water Resources
CE 282: Hydraulic Modeling
CE 298: Research
CE 299–300: Thesis Research
CE 310: Sedimentation Engineering
CE 311: Mechanics of Alluvial Channels
CE 312: Advanced Hydraulics
CE 398: Advanced Reading and Research
CE 399: Dissertation Research

*For Microbiology and Urban and Regional Planning course descriptions, see the *Undergraduate and Graduate Bulletin*.

EngS 260:	Random Process Theory in Engineering
EngS 284:	Numerical Methods in Engineering
EngS 285:	Finite Element Methods in Engineering Mechanics
ME 221:	Intermediate Fluid Mechanics
ME 227:	Viscous Flow
ME 231:	Hydrodynamics
ME 277:	Numerical Methods in Fluid Mechanics
ME 312:	Theory of Turbulence
OR 251:	Linear Programming
OR 252:	Nonlinear Programming
OR 273:	Digital Systems Simulation

Required courses for MS Degree: ApSc 211 and/or 213 (depending on adviser's approval), CE 212, 213, ME 221; for Professional and DSc Degrees: ApSc 213, 215, CE 282, 312, ME 231.

Option III: Water Resources Planning

ApSc 213:	Analytical Methods in Engineering III
CE 212:	Open Channel Flow
CE 213:	Hydraulic Structures
CE 214:	Design of Dams
CE 216:	Advanced Hydrology
CE 242:	Solid Waste Disposal
CE 243:	Environmental Impact Assessment
CE 273:	Water Supply Engineering
CE 276:	Water Resources Planning and Control
CE 278:	Pollution Transport System
CE 279:	Unit Operations in Environmental Engineering
CE 280:	Water Resources Systems
CE 281:	Special Topics in Water Resources
CE 282:	Hydraulic Modeling
CE 298:	Research
CE 299–300:	Thesis Research
CE 310:	Sedimentation Engineering
CE 311:	Mechanics of Alluvial Channels
EAd 211–12:	Engineering Administration
EAd 269:	Elements of Decision-making and Problem-solving
EAd 283:	Systems Engineering I
EAd 284:	Systems Engineering II
EngS 206:	Technology and Human Needs
EngS 213:	Renewable Resources
EngS 260:	Random Process Theory in Engineering
EngS 284:	Numerical Methods in Engineering
ME 221:	Intermediate Fluid Mechanics
OR 251:	Linear Programming
OR 252:	Nonlinear Programming
OR 253:	Integer, Network, and Dynamic Programming
OR 271:	Forecasting Techniques
OR 273:	Digital Systems Simulation
OR 377:	Advanced Stochastic Models in Operations Research

Econ 217–18: Survey of Economics
*Econ 235: Energy Resources and Policy
*Econ 237: Seminar: Economics of the Environment and Natural Resources
*Geog 222: Seminar: Resources and the Environment
*Geog 223: Seminar: The Population-Food Balance
*PSc 206: Science, Technology, and Public Affairs

Required courses for MS Degree: CE 212, 213, 276, 280.

ENVIRONMENTAL MODELING†

ApSc 211: Analytical Methods in Engineering I
ApSc 213: Analytical Methods in Engineering III
*EngS 263: Atmospheric Physics for Engineers I
*EngS 264: Atmospheric Physics for Engineers II
EngS 284: Numerical Methods in Engineering
EngS 298: Research
EngS 299–300: Thesis Research
EngS 314: Advanced Numerical Methods in Engineering
ME 221: Intermediate Fluid Mechanics
ME 227: Viscous Flow
ME 231: Hydrodynamics
ME 257: Energy Technology I
ME 265: Air-pollution Meteorology
ME 285: Reaction Kinetics
ME 288: Convective Heat and Mass Transfer
ME 289: Radiative Heat Transfer
ME 296: Special Topics in Heat and Mass Transfer
ME 312: Theory of Turbulence

FLUID MECHANICS AND THERMAL SCIENCES

ApSc 211: Analytical Methods in Engineering I
ApSc 212: Analytical Methods in Engineering II
ApSc 213: Analytical Methods in Engineering III
ApSc 214: Analytical Methods in Engineering IV
ApSc 215: Analytical Methods in Engineering V
ApSc 216: Special Topics in Engineering Analysis
CE 274: Mechanics of Water Waves
EE 133: Electromagnetic Waves
EE 236: Plasma Dynamics
EngS 218: Introduction to Continuum Mechanics
EngS 289: Special Topics in Theoretical and Applied Mechanics
EngS 315: Introduction to Nonlinear Mechanics of Continua
ME 218: Design of Floating and Submerged Marine Vehicles
ME 221: Intermediate Fluid Mechanics
ME 222: Applied Fluid Dynamics
ME 223: Aeroelasticity
ME 227: Viscous Flow
ME 231: Hydrodynamics
ME 235: Compressible Flow
ME 277: Numerical Methods in Fluid Mechanics
ME 280: Intermediate Thermodynamics
ME 281: Nonequilibrium Thermodynamics
ME 282: Fossil Fuels
ME 287: Heat Conduction

*For course descriptions, see the *Undergraduate and Graduate Bulletin.*
†Offered at NASA-Langley Research Center; may be offered on campus when arranged.

ME 288:	Convective Heat and Mass Transfer
ME 289:	Radiative Heat Transfer
ME 295:	Statistical Thermodynamics
ME 297:	Special Topics in Fluid Mechanics
ME 298:	Research
ME 299–300:	Thesis Research
ME 310:	Mechanics of Non-Newtonian Fluids
ME 311:	Nonsteady Flow
ME 312:	Theory of Turbulence
ME 313:	Magnetofluidmechanics
ME 315:	Hypersonic Flow
ME 317:	Physical Gas Dynamics
ME 398:	Advanced Reading and Research
ME 399:	Dissertation Research

Required courses for MS Degree: ApSc 211, 213, ME 221 and 280 (also ME 227 for nonthesis students); for Professional and DSc Degrees: Fluid Mechanics—ApSc 212 or 214 or 216, 215, ME 231, 288, 311 and 312; Thermal Sciences—ApSc 212 or 214 or 216, 215, ME 235, 288, 287 and 289.

GEOTECHNICAL ENGINEERING

ApSc 211:	Analytical Methods in Engineering I
ApSc 213:	Analytical Methods in Engineering III
CE 201:	Design of Metal Structures
CE 202:	Design of Reinforced Concrete Structures
CE 203:	Prestressed Concrete Structures
CE 204:	Applied Soil Mechanics I
CE 205:	Applied Soil Mechanics II
CE 206:	Foundation Engineering
CE 207:	Soil Dynamics
CE 208:	Rock Engineering
CE 209:	Theoretical Soil Mechanics
CE 210:	Methods of Structural Analysis
CE 212:	Open Channel Flow
CE 213:	Hydraulic Structures
CE 214:	Design of Dams
CE 219:	Groundwater and Seepage
CE 221:	Pavement and Runway Design
CE 252:	General Structural Dynamics
CE 253:	Failure and Reliability Analysis of Engineering Structures
CE 254:	Special Topics in Structural Engineering
CE 256:	Introduction to Ocean and Coastal Engineering
CE 257:	Harbor and Coastal Engineering I
CE 265:	Special Topics in Geotechnical Engineering
CE 282:	Hydraulic Modeling
CE 298:	Research
CE 299–300:	Thesis Research
CE 310:	Sedimentation Engineering
CE 311:	Mechanics of Alluvial Channels
EngS 221:	Theory of Elasticity I
EngS 222:	Theory of Elasticity II
EngS 256:	Introduction to the Theories of Inelastic Media
EngS 284:	Numerical Methods in Engineering
EngS 285:	Finite Element Methods in Engineering Mechanics
EngS 288:	Advanced Finite Element Methods in Structural Mechanics

*Geol 128: Geomorphology
*Geol 189: Geophysics for Geologists
*Geol 224: Advanced Structural Geology

...ired courses for MS Degree: ApSc 211 or 213, CE 204, 205, 206 and EngS 285.
...Professional Degree: CE 207, 208, 219, and EngS 221.

...DROMECHANICS AND OCEAN ENGINEERING

ApSc 211: Analytical Methods in Engineering I
ApSc 212: Analytical Methods in Engineering II
ApSc 213: Analytical Methods in Engineering III
ApSc 214: Analytical Methods in Engineering IV
ApSc 215: Analytical Methods in Engineering V
ApSc 216: Special Topics in Engineering Analysis
CE 203: Prestressed Concrete Structures
CE 206: Foundation Engineering
CE 208: Rock Engineering
CE 212: Open Channel Flow
CE 213: Hydraulic Structures
CE 214: Design of Dams
CE 216: Advanced Hydrology
CE 219: Groundwater and Seepage
CE 253: Failure and Reliability Analysis of Engineering Structures
CE 255: Coastal Processes
CE 256: Introduction to Ocean and Coastal Engineering
CE 257: Harbor and Coastal Engineering I
CE 258: Harbor and Coastal Engineering II
CE 265: Special Topics in Geotechnical Engineering
CE 274: Mechanics of Water Waves
CE 275: Special Topics in Ocean Engineering
CE 282: Hydraulic Modeling
CE 298: Research
CE 299–300: Thesis Research
CE 310: Sedimentation Engineering
CE 311: Mechanics of Alluvial Channels
CE 312: Advanced Hydraulics
CE 398: Advanced Reading and Research
CE 399: Dissertation Research
EngS 228: Physical Oceanography
EngS 260: Random Process Theory in Engineering
EngS 273: Time Series Analysis
*Geol 181: General Oceanography
ME 215: Theory of Vibrations
ME 218: Design of Floating and Submerged Marine Vehicles
ME 221: Intermediate Fluid Mechanics
ME 227: Viscous Flow
ME 231: Hydrodynamics
ME 277: Numerical Methods in Fluid Mechanics
ME 297: Special Topics in Fluid Mechanics
ME 312: Theory of Turbulence

...quired courses for degree programs in Hydromechanics: MS—ApSc 211, 213, ...S 260, and ME 221; DSc—ApSc 212, 214, 215, CE 274, ME 227, 231, and 312.

*For Geology course descriptions, see the *Undergraduate and Graduate Bulletin*.

Required courses for degree programs in Ocean (and Coastal) Engineering: MS—ApSc 211, 213, EngS 260 and ME 221; DSc—ApSc 212, 215, CE 256, 274, ME 231, and ME 215 or EngS 273.

MECHANICAL ENGINEERING DESIGN

ApSc 213:	Analytical Methods in Engineering III
CE 253:	Failure and Reliability Analysis of Engineering Structures
EngS 215:	Advanced Strength of Materials
EngS 251–52:	Transportation Workshop
EngS 282:	Computer-aided Design
EngS 283:	Application of Computer Graphics in Engineering
ME 215:	Theory of Vibrations
ME 218:	Design of Floating and Submerged Marine Vehicles
ME 221:	Intermediate Fluid Mechanics
ME 225:	Turbomachinery I
ME 226:	Turbomachinery II
ME 240:	Kinematic Synthesis
ME 241:	Engineering Systems Design
ME 242:	Advanced Mechanisms
ME 243:	Advanced Mechanical Engineering Design
ME 246:	Electromechanical Control Systems
ME 247:	Fluidics
ME 251:	Advanced Electromechanical Control Systems
ME 298:	Research
ME 299–300:	Thesis Research

Required courses for MS Degree: ApSc 213, ME 241, 243, and 246.

PUBLIC WORKS ENGINEERING

CE 201:	Design of Metal Structures
CE 202:	Design of Reinforced Concrete Structures
CE 203:	Prestressed Concrete Structures
CE 204:	Applied Soil Mechanics I
CE 205:	Applied Soil Mechanics II
CE 206:	Foundation Engineering
CE 208:	Rock Engineering
CE 211:	Physical and Chemical Wastewater Treatment
CE 212:	Open Channel Flow
CE 213:	Hydraulic Structures
CE 214:	Design of Dams
CE 215:	Urban Construction Technology
CE 216:	Advanced Hydrology
CE 217:	Water Resources Engineering
CE 220:	Urban Transportation Engineering
CE 221:	Pavement and Runway Design
CE 223:	Traffic Engineering
CE 237:	Advanced Sanitary Engineering Design
CE 242:	Solid Waste Disposal
CE 243:	Environmental Impact Assessment
CE 250:	Advanced Metal Structures
CE 251:	Advanced Reinforced Concrete Structures
CE 253:	Failure and Reliability Analysis of Engineering Structures
CE 255:	Coastal Processes
CE 256:	Introduction to Ocean and Coastal Engineering
CE 257:	Harbor and Coastal Engineering I
CE 258:	Harbor and Coastal Engineering II
CE 276:	Water Resources Planning and Control

CE 280: Water Resources Systems
CE 281: Special Topics in Water Resources
CE 282: Hydraulic Modeling
CE 310: Sedimentation Engineering
CE 311: Mechanics of Alluvial Channels
EAd 204: Administration of Engineering Contracts
EAd 210: Engineering Law
EAd 241: Construction Management I
EAd 242: Construction Management II
EAd 243: Construction Management III
EAd 261: Economic Analysis in Engineering Planning
EngS 284: Numerical Methods in Engineering
OR 201: Survey of Operations Research Methods

...quired courses for MS Degree: CE 202, 206, 220, 243, 276, and EAd 241 or 242 or ... for Professional Degree: CE 211 or 217 or 223, EngS 284 or OR 201, and one ...tional course from the sequence EAd 241, 242, 243.

...LID MECHANICS AND MATERIALS ENGINEERING

ApSc 211: Analytical Methods in Engineering I
ApSc 212: Analytical Methods in Engineering II
ApSc 213: Analytical Methods in Engineering III
ApSc 214: Analytical Methods in Engineering IV
ApSc 215: Analytical Methods in Engineering V
ApSc 216: Special Topics in Engineering Analysis
CE 207: Soil Dynamics
CE 209: Theoretical Soil Mechanics
CE 252: General Structural Dynamics
CE 253: Failure and Reliability Analysis of Engineering Structures
CE 254: Special Topics in Structural Engineering
CE 261: Analysis of Plates and Shells
CE 263: Theory of Structural Stability
EngS 215: Advanced Strength of Materials
EngS 217: Analytical Mechanics
EngS 218: Introduction to Continuum Mechanics
EngS 221: Theory of Elasticity I
EngS 222: Theory of Elasticity II
EngS 229: Transformations in Materials
EngS 230: Deformation of Materials
EngS 231: Structure of Materials
EngS 233: Mechanics of Composite Materials
EngS 234: Composite Materials
EngS 236: Experimental Techniques in Materials Science
EngS 237: Environmental Effects on Materials I
EngS 238: Environmental Effects on Materials II
EngS 240: Fracture Mechanics
EngS 241: Fatigue and Failure of Materials
EngS 242: Materials Recycling and Recovery
EngS 249: Special Topics in Materials Science
EngS 256: Introduction to the Theories of Inelastic Media
EngS 259: Random Vibration of Structures
EngS 284: Numerical Methods in Engineering
EngS 285: Finite Element Methods in Engineering Mechanics
EngS 288: Advanced Finite Element Methods in Structural Mechanics
EngS 289: Special Topics in Theoretical and Applied Mechanics
EngS 298: Research

EngS 299–300:	Thesis Research
EngS 315:	Introduction to Nonlinear Mechanics of Continua
EngS 398:	Advanced Reading and Research
EngS 399:	Dissertation Research
ME 215:	Theory of Vibrations
ME 216:	Structural Dynamics
ME 221:	Intermediate Fluid Mechanics
ME 280:	Intermediate Thermodynamics
ME 281:	Nonequilibrium Thermodynamics
ME 295:	Statistical Thermodynamics
ME 310:	Mechanics of Non-Newtonian Fluids

Required courses for degree programs in Solid Mechanics: MS—ApSc 211, 213, EngS 218 and 221; Professional Degree—EngS 222, 240, 241, 256 and 285; D Sc—ApSc 212, 215, EngS 222, 233, 256, and 315.

Required courses for degree programs in Materials Engineering: MS—ApSc 211, 213, EngS 229 and 231; Professional Degree—EngS 230, 234, 237, 240, and 241. D Sc—ApSc 212, EngS 229, 230, 231, 240 and 256.

STRUCTURAL ENGINEERING

ApSc 212:	Analytical Methods in Engineering II
ApSc 213:	Analytical Methods in Engineering III
ApSc 214:	Analytical Methods in Engineering IV
CE 201:	Design of Metal Structures
CE 202:	Design of Reinforced Concrete Structures
CE 203:	Prestressed Concrete Structures
CE 204:	Applied Soil Mechanics I
CE 205:	Applied Soil Mechanics II
CE 206:	Foundation Engineering
CE 207:	Soil Dynamics
CE 210:	Methods of Structural Analysis
CE 215:	Urban Construction Technology
CE 250:	Advanced Metal Structures
CE 251:	Advanced Reinforced Concrete Structures
CE 252:	General Structural Dynamics
CE 253:	Failure and Reliability Analysis of Engineering Structures
CE 254:	Special Topics in Structural Engineering
CE 256:	Introduction to Ocean and Coastal Engineering
CE 257:	Harbor and Coastal Engineering I
CE 258:	Harbor and Coastal Engineering II
CE 261:	Analysis of Plates and Shells
CE 262:	Design of Plate and Shell Structures
CE 263:	Theory of Structural Stability
CE 266:	Design Procedures for Earthquake, Extreme Wind, and Other Natural Hazards I
CE 267:	Design Procedures for Earthquake, Extreme Wind, and Other Natural Hazards II
CE 298:	Research
CE 299–300:	Thesis Research
CE 398:	Advanced Reading and Research
CE 399:	Dissertation Research
EngS 215:	Advanced Strength of Materials
EngS 221:	Theory of Elasticity I
EngS 233:	Mechanics of Composite Materials

EngS 234: Composite Materials
EngS 240: Fracture Mechanics
EngS 241: Fatigue and Failure of Materials
EngS 256: Introduction to the Theories of Inelastic Media
EngS 259: Random Vibration of Structures
EngS 282: Computer-aided Design
EngS 283: Application of Computer Graphics in Engineering
EngS 284: Numerical Methods in Engineering
EngS 285: Finite Element Methods in Engineering Mechanics
EngS 288: Advanced Finite Element Methods in Structural Mechanics

...ired courses for MS Degree: ApSc 213, CE 201 or 202, CE 210, EngS 215 or ... and EngS 284; for Professional Degree: CE 250 or 251, CE 252 or 253, CE 262, ... EngS 282 or 288; for D Sc Degree: ApSc 212, 213 or 214, CE 252, 254, EngS ...and 288.

...UCTURES AND DYNAMICS*

ApSc 211: Analytical Methods in Engineering I
ApSc 212: Analytical Methods in Engineering II
ApSc 213: Analytical Methods in Engineering III
ApSc 214: Analytical Methods in Engineering IV
ApSc 215: Analytical Methods in Engineering V
ApSc 216: Special Topics in Engineering Analysis
CE 253: Failure and Reliability Analysis of Engineering Structures
CE 254: Special Topics in Structural Engineering
CE 261: Analysis of Plates and Shells
CE 263: Theory of Structural Stability
EE 157: Machine and Assembly Language Programming
EngS 221: Theory of Elasticity I
EngS 222: Theory of Elasticity II
EngS 234: Composite Materials
EngS 259: Random Vibration of Structures
*EngS 281: Advanced Programming Techniques for Engineering Mechanics Problems
EngS 282: Computer-aided Design
EngS 283: Application of Computer Graphics in Engineering
EngS 284: Numerical Methods in Engineering
EngS 285: Finite Element Methods in Engineering Mechanics
*EngS 286: Analysis and Design of Thin-walled Structures
*EngS 287: Automated Design of Complex Structures
EngS 288: Advanced Finite Element Methods in Structural Mechanics
EngS 289: Special Topics in Theoretical and Applied Mechanics
...S 299–300: Thesis Research
EngS 314: Advanced Numerical Methods in Engineering
EngS 398: Advanced Reading and Research
EngS 399: Dissertation Research
ME 215: Theory of Vibrations
ME 216: Structural Dynamics
ME 223: Aeroelasticity
*ME 248: Seminar: Aircraft Design I
OR 251: Linear Programming
OR 252: Nonlinear Programming

...ered at NASA-Langley Research Center; may be offered on campus when arranged.

TRANSPORTATION ENGINEERING

Option I: Technology of the Vehicle

ApSc 213:	Analytical Methods in Engineering III
ApSc 214:	Analytical Methods in Engineering IV
ApSc 215:	Analytical Methods in Engineering V
CE 201:	Design of Metal Structures
CE 210:	Methods of Structural Analysis
CE 220:	Urban Transportation Engineering
CE 252:	General Structural Dynamics
CE 253:	Failure and Reliability Analysis of Engineering Structures
CE 261:	Analysis of Plates and Shells
CE 263:	Theory of Structural Stability
EngS 221:	Theory of Elasticity I
EngS 241:	Fatigue and Failure of Materials
EngS 251–52:	Transportation Workshop
EngS 253:	Control of Automated Transit Networks
EngS 259:	Random Vibration of Structures
EngS 260:	Random Process Theory in Engineering
EngS 285:	Finite Element Methods in Engineering Mechanics
EngS 288:	Advanced Finite Element Methods in Structural Mechanics
EngS 315:	Introduction to Nonlinear Mechanics of Continua
ME 215:	Theory of Vibrations
ME 218:	Design of Floating and Submerged Marine Vehicles
ME 221:	Intermediate Fluid Mechanics
ME 222:	Applied Fluid Dynamics
ME 223:	Aeroelasticity
ME 225:	Turbomachinery I
ME 226:	Turbomachinery II
ME 227:	Viscous Flow
ME 231:	Hydrodynamics
ME 237:	Energetics of Fluid Flow I
ME 238:	Energetics of Fluid Flow II
ME 241:	Engineering Systems Design
ME 243:	Advanced Mechanical Engineering Design
ME 246:	Electromechanical Control Systems
ME 250:	Design of Complex Systems
ME 251:	Advanced Electromechanical Control Systems
ME 255–56:	Urban Transportation Technology
ME 275:	Stability and Control of Vehicles
ME 286:	Special Topics in Mechanical Engineering
ME 293:	Combustion
ME 298:	Research
ME 299–300:	Thesis Research
ME 311:	Nonsteady Flow
ME 398:	Advanced Reading and Research
ME 399:	Dissertation Research
*U&RP 208:	Urban Transportation Planning
*U&RP 209:	Urban Transportation Models

Required courses for MS Degree: (Mechanical) CE 220, EngS 251, ME 221 and 237; (Structural)—CE 210, 220, 252 and EngS 251.

For DSc Degree (Mechanical) ApSc 213, 215, ME 293 and ME 238 or 311; (Structural)—ApSc 213 or 214, CE 252, EngS 285, 288, 221 or 315.

* For Urban and Regional Planning course descriptions, see the *Undergraduate and Graduate Bulletin*.

Option II: The Way (Route Structures and Facilities)

ApSc 212: Analytical Methods in Engineering II
ApSc 213: Analytical Methods in Engineering III
ApSc 214: Analytical Methods in Engineering IV
CE 201: Design of Metal Structures
CE 202: Design of Reinforced Concrete Structures
CE 203: Prestressed Concrete Structures
CE 204: Applied Soil Mechanics I
CE 205: Applied Soil Mechanics II
CE 206: Foundation Engineering
CE 207: Soil Dynamics
CE 209: Theoretical Soil Mechanics
CE 210: Methods of Structural Analysis
CE 220: Urban Transportation Engineering
CE 221: Pavement and Runway Design
CE 222: Stations and Terminals
CE 223: Traffic Engineering
CE 252: General Structural Dynamics
CE 253: Failure and Reliability Analysis of Engineering Structures
CE 256: Introduction to Ocean and Coastal Engineering
CE 257: Harbor and Coastal Engineering I
CE 258: Harbor and Coastal Engineering II
CE 310: Sedimentation Engineering
CE 311: Mechanics of Alluvial Channels
EngS 221: Theory of Elasticity I
EngS 240: Fracture Mechanics
EngS 241: Fatigue and Failure of Materials
EngS 251–52: Transportation Workshop
EngS 253: Control of Automated Transit Networks
EngS 259: Random Vibration of Structures
EngS 285: Finite Element Methods in Engineering Mechanics
EngS 288: Advanced Finite Element Methods in Structural Mechanics
EngS 298: Research
EngS 299–300: Thesis Research
EngS 315: Introduction to Nonlinear Mechanics of Continua
EngS 398: Advanced Reading and Research
EngS 399: Dissertation Research
ME 255–56: Urban Transportation Technology
OR 231: Theory of Traffic Flow
*U&RP 208: Urban Transportation Planning
*U&RP 209: Urban Transportation Models

...ested courses for MS Degree: CE 201 or 202, 210, 220, 221 or 223, and EngS ... for DSc Degree: ApSc 212, 213 or 214, CE 252, EngS 285, 288, and EngS ... or 315.

Option III: Transportation Systems†

CE 220: Urban Transportation Engineering
CE 223: Traffic Engineering
CE 243: Environmental Impact Assessment
EAd 261: Economic Analysis in Engineering Planning
EAd 265: Transportation Management I
EAd 266: Transportation Management II

...for Urban and Regional Planning course descriptions, see the *Undergraduate and Graduate* ...

†Prerequisite courses for admission to this option are ApSc 115 and Stat 191 (see the *Undergraduate* ... *Graduate Bulletin*).

EAd 281–82:	Systems Analysis and Management
EngS 251–52:	Transportation Workshop
EngS 253:	Control of Automated Transit Networks
ME 255–56:	Urban Transportation Technology
ME 298:	Research
ME 299–300:	Thesis Research
OR 201:	Survey of Operations Research Methods I
OR 202:	Survey of Operations Research Methods II
OR 231:	Theory of Traffic Flow
OR 251:	Linear Programming
OR 252:	Nonlinear Programming
OR 271:	Forecasting Techniques
OR 273:	Digital Systems Simulation
OR 277:	Queuing Theory
*U&RP 201:	Introduction to Urban and Regional Planning
U&RP 208:	Urban Transportation Planning
*U&RP 209:	Urban Transportation Models

Required courses for MS Degree: CE 220, 223, EngS 251, and OR 201.

Civil Engineering Graduate Courses

201 **Design of Metal Structures** (3)

Structural behavior of metal structures, conception and design of advanced structural components and systems, hysteretic behavior, plastic design principles, box type girders, cable systems, composite girders, and special topics. Prerequisite: CE 191 or equivalent. (Spring)

202 **Design of Reinforced Concrete Structures** (3)

Structural behavior of reinforced concrete structures, conception and design of structural components, prestressed concrete, slabs, ultimate strength and deformation, box type girders, hysteretic behavior, safety considerations, and special topics. Prerequisite: CE 192 or equivalent. (Fall)

203 **Prestressed Concrete Structures** (3)

Structural behavior and failure modes of prestressed concrete structures, design in prestressed concrete, including long-span structures, bridges, and precast systems. Prerequisite: CE 192 or equivalent. (Spring)

204 **Applied Soil Mechanics I** (3)

Theories of soil strength; bearing capacity of shallow foundations and their design; deep foundations, including pile types and design criteria; theories of lateral earth pressure with applications; stability analyses of slopes. Selected experiments in the soil mechanics laboratory. Prerequisite: approval of Department. (Spring)

205 **Applied Soil Mechanics II** (3)

Nature of soil, including geological and pedological aspects; flow of water in soil; seepage involving foundations, dams, and wells; stress distribution in earth masses; one- and three-dimensional theories of consolidation; analysis of settlement. Selected experiments in the soil mechanics laboratory. Prerequisite: approval of Department. (Fall)

206 **Foundation Engineering** (3)

Principles of soil mechanics and structural mechanics applied to the analysis and design of spread footings and mat foundations, pile founda-

* For Urban and Regional Planning course descriptions, see the *Undergraduate and Graduate*

tions, retaining structures, including sheeting and bracing systems, and waterfront structures. Problems associated with subsurface exploration, dewatering excavations, and underpinning. Prerequisite: approval of Department. (Spring)

Soil Dynamics (3)

Stress-strain behavior of soil under transient and repeated loads, effects of earthquakes upon foundations and earth dams, design of machinery foundations. Prerequisite: CE 204. (As arranged)

Rock Engineering (3)

Classification and properties of rock; nature of rock masses and rock discontinuities; field exploration; methods of excavation; design and applications to foundation slopes, tunnels, and chambers in rock. Prerequisite: approval of Department. (As arranged)

Theoretical Soil Mechanics (3)

Advanced theories of consolidation. Yield condition in soils. Application of theories of plasticity in soil mechanics. Elements of wave propagation in soils, including surface waves. Prerequisite: ApSc 213, and CE 204 or 205. (As arranged)

Methods of Structural Analysis (3)

Modern methods of analysis of statically indeterminate structures, matrix analysis based on flexibility, stiffness, energy and variational methods, substructuring techniques; consideration of plastic collapse of structures; introduction to the finite element method. Prerequisite: graduate status. (Fall)

Physical and Chemical Wastewater Treatment (3)

Theory and application of physical and chemical operation and processes for wastewater treatment. Topics of discussion will include sedimentation; flotation; disinfection; coagulation; flocculation; filtration; carbon adsorption; reverse osmosis; ion exchange and thickening. Prerequisite: CE 197 or equivalent; prerequisite or concurrent registration: CE 241. (Fall)

Open Channel Flow (3)

Types and regimes of flow; energy and momentum principles, uniform flow, gradually varied flow, spatially and rapidly varied flow. Flow in non-prismatic channels. Unsteady flow; dam break problem, flood routing. Prerequisite: CE 193 or ME 221. (Fall)

Hydraulic Structures (3)

Forces on structures and hydraulic design criteria. Design of conveyance, diversion, cross drainage, protective and water measurement structures. Prerequisite: CE 212 or approval of Department.

Design of Dams (3)

Project planning and investigations. Types of dams; design of earth-rock fill dams and concrete gravity dams. Design of outlets, spillways, and appurtenances. Construction methods for dams. Reservoir sedimentation. Safety inspection of dams. Prerequisite: CE 193 or graduate status. (Spring, even years)

215 Urban Construction Technology (3)

Precedents and contemporary trends in urban housing, building, and planning technology. Prerequisite: approval of Department. (Spring)

216 Advanced Hydrology (3)

Precipitation, evaporation, and transpiration. Soil physics; stream flow drainage basins, hydrograph analysis, and stream-flow routing. Design criteria, flood frequency statistics and analysis, flood forecasting and control, water supply forecasting. Prerequisite: CE 195 or equivalent. (Spring)

219 Groundwater and Seepage (3)

Permeability theory of groundwater flow, flownets, analogs, computer solutions; applications to engineering problems such as excavation dewatering, flow through dams, stabilization of earth slopes. Prerequisite: ApS 211. (Fall)

220 Urban Transportation Engineering (3)

Introduction to urban transportation planning. Analysis of urban transportation requirements. Evaluation procedure for the selection between alternative solutions. Prerequisite: approval of Department. (Fall)

221 Pavement and Runway Design (3)

Pavement types, wheel-load characteristics; stresses in pavements and subgrades; empirical methods of design of flexible and rigid highway and airfield pavements; general principles of runway design. Prerequisite: CE 202, and 204 or 205. (Spring)

222 Stations and Terminals (3)

Unified treatment of the functions and operation of stations and terminals of transportation systems; emphasis on specifications and planning criteria. Problems of locating the facility, passenger and freight handling, intra-modal and inter-modal interfacing, communication and control. Illustrations include railroad and subway stations, bus terminals, airports, and harbors. Prerequisite: approval of Department. (Spring)

223 Traffic Engineering (3)

Roadway traffic capacity and other road network performance measures; methods of characterizing steady and unsteady traffic flow phenomena; traffic behavior monitoring techniques, instruments, and data processing; impact of vehicle and operator dynamics on traffic flow behavior; road bottleneck flow dynamics; traffic control signalization theory and practical implementation; traffic signal control systems for conventional street networks and limited access expressways; examples of traffic control system implementations. Prerequisite: approval of Department. (Fall)

237 Advanced Sanitary Engineering Design (3)

Basic principles and practical considerations; hydraulic and structural requirements; basic parameters and elements of design; layout and design of water supply and sewage systems, pumping stations, and wastewater treatment plants; development of design parameters; cost and financing; existing plant expansions. Prerequisite: graduate status. (Fall)

440 Environmental Microbiology (3)

Basic cellular organizations and processes related to waste treatment; microorganisms as disease-carrying agents in natural and waste water; laboratory tests for coliform organisms and viruses, and analysis of activated sludge. Prerequisite: approval of Department. (Spring)

441 Environmental Chemistry (3)

Chemical composition and chemical analysis of water; chemical treatment of water and waste water; laboratory tests of solids, BOD, COD, phosphorus, nitrogen, etc., as related to water quality. Prerequisite: approval of Department. (Fall)

442 Solid Waste Disposal (3)

Characteristics of solid waste; collection, transportation, and disposal practices; regional planning and management; resource and energy recovery from solid waste. Prerequisite: approval of Department. (Fall)

443 Environmental Impact Assessment (3)

Public policy and legislation at federal, state, and local levels concerning quality of the environment. Strategies and methodologies which have been developed to assess impact of engineering projects. Technology of assessing impact on air and water quality and on land use, applied to transportation facilities, water supply and pollution control facilities, and industrial and community development. Prerequisite: approval of Department. (Fall)

450 Advanced Metal Structures (3)

Conception, analysis, and design of low-rise and high-rise buildings by elastic and inelastic methods, suspended roofs, earthquake considerations, and unique structural systems. Prerequisite: CE 201 or equivalent. (Fall)

451 Advanced Reinforced Concrete Structures (3)

Conception, analysis, and design of low-rise and high-rise buildings by ultimate strength methods, precast systems, progressive collapse, earthquake considerations, domes, folded plates, shell-type structures and special topics. Prerequisite: CE 202 or equivalent. (Spring)

452 General Structural Dynamics (3)

Analysis of single and multiple degree of freedom structural system under steady-state and transient loads; response of discretized structural systems, such as rigid frames, plates, and thin shells under dynamic loads, including earthquakes, wind, and blastic loading; introduction to probabilistic methods in structural dynamics. Prerequisite: ApSc 115, CE 210, or equivalent; and approval of Department. (Spring)

453 Failure and Reliability Analysis of Engineering Structures (3)

Operational and structural failure mechanisms; instability, fracture, and fatigue. Operational and structural safety, probability of failure. Aspects of probabilistic structural analysis, statistics of extremes, risk and reliability, optimal design criteria. Prerequisite: ApSc 115 or equivalent. (Fall)

454 Special Topics in Structural Engineering (3)

Selected problems in structural mechanics and design: (1) thermal stresses in structural systems, (2) advanced probabilistic structural mechanics, (3)

structural design for dynamic loads, (4) structural design for repeated loads, or (5) advanced structural applications. May be repeated for credit. Prerequisite: CE 210 and approval of Department. Topic to be announced in the *Schedule of Classes.* (As arranged)

255 Coastal Processes (3)

Longshore currents and nearshore circulation; coastal sediment properties and analysis, longshore transport processes and rates; sediment budget; response of beaches to wave action and structures; tidal inlets, mechanical bypassing; beach nourishment; wind transport of sandy dune stabilization; sediment tracing. Prerequisite: approval of Department. (Spring)

256 Introduction to Ocean and Coastal Engineering (3)

Application of wave mechanics to the analysis of wave motion in coastal and offshore regions: reflection, diffraction, refraction. Wave spectra: procurement of spectral data by direct measurement or from hind-casting techniques. Beaches and littoral drift, mixing processes, outfalls and intakes in the oceans and estuaries, wave forces on coastal and offshore structures, harbor oscillations, tides in estuaries. Prerequisite: ApSc 115, ME 221; or equivalent. (Fall)

257 Harbor and Coastal Engineering I (3)

Waves and swells, tides and currents, coastal regime, estuaries and deltas, structures for coastal protection, principles of harbor navigation, harbor planning and harbor design, breakwaters and sea walls, quays, docks, internal access structures; maintenance of external and internal access, dredging. Prerequisite: CE 256. (Spring)

258 Harbor and Coastal Engineering II (3)

Interaction between structures and waves. Analysis and design of flexible structures: piers, jetties, and protective structures; off-shore drilling platforms. Design criteria, moorings and cables, harbor operations equipment. Prerequisite: CE 252 or equivalent; CE 257. (Fall)

261 Analysis of Plates and Shells (3)

Bending and stretching of thin elastic plates under loading with various boundary conditions, continuous plates and plates on elastic foundations, theory of folded plate structures. Theory of curved surfaces; general linear bending theory and its simplification to membrane theory; bending stresses in shells of revolution, shallow shell theory. Specific applications. Prerequisite: graduate status. (Spring)

262 Design of Plate and Shell Structures (3)

Design of long-span plate and shell roof structures in reinforced concrete and metal; design of containers for fluids and granular materials, computer applications in the analysis of such structures. Prerequisite: CE 201, 202, 261; or equivalent. (Fall)

263 Theory of Structural Stability (3)

General criteria for stability; buckling of elastic and inelastic columns, rigid frames; torsional and lateral buckling; variational methods. Buckling of plates and shells under static loads; stability of stiffened structures, effect of imperfections and boundary conditions. Prerequisite: graduate status. (Fall)

265 Special Topics in Geotechnical Engineering (3)
Selected topics such as rheology of soils, computer applications, excavation and tunneling, ocean engineering problems, or other special topics. May be repeated for credit. Prerequisite: approval of Department. (As arranged)

266 Design Procedures for Earthquake, Extreme Wind, and Other Natural Hazards I (3)
Nature of dynamic loads in problems which arise from earthquakes, tornadoes, hurricanes, and recurring winds; other natural hazard loading such as floods, expansive soils, storm surges, and tsunamis; characteristics of earthquakes; seismicity, zoning maps, response spectra, wind characterization, and wind tunnel simulation. Use of probabilistic concepts in load determination. Prerequisite: approval of Department. (Spring)

267 Design Procedures for Earthquake, Extreme Wind, and Other Natural Hazards II (3)
Brief review of natural hazard loadings and random formulation; earthquake and wind design considerations and procedures; review of code requirements and specifications; balanced risk approach for natural hazards; cost effectiveness of integrated natural hazard design; special problems. Prerequisite: CE 266 or approval of Department. (Fall)

271 Theoretical Marine Hydromechanics (3)
Introductory course designed to acquaint the student with some physical concepts and mathematical tools of theoretical marine hydromechanics. Derivation of the fundamental equations and boundary conditions of a fluid media; application of potential-flow theory to fluid motion around two- and three-dimensional bodies; perturbation concepts. Introduction to thin-ship and slender-body theories. Derivation of force and movement of bodies in calm and disturbed water. Prerequisite: approval of Department. Offered off-campus only. (As arranged)

272 Biological Wastewater Treatment (3)
Theory and application of biological methods for wastewater treatment. Principles of biological treatment; biological lagoons; trickling filter activated sludge process; anaerobic and aerobic digestion of sludge. Prerequisite or corequisite: CE 240. (Spring)

273 Water Supply Engineering (3)
Quantity and quality aspects of water supply engineering are discussed. Topics include reservoir sizing, groundwater, distribution systems, treatment processes and chemistry of waters. Prerequisite or corequisite: CE 240 and 241. (Fall)

274 Mechanics of Water Waves (3)
Irrotational theory for deep- and shallow-water waves, reflexion, refraction, diffraction, attenuation. Water waves of finite amplitude: shallow-water theory, tides, bores, long-waves theory, conoidal and solitary waves. Wave generation by wind, state-of-the-art based on correlation between theory and measurements. Wave-breaking and reflexion. Prerequisite: MR 221 or equivalent and permission of instructor. (Fall)

275 **Special Topics in Ocean Engineering** (3)
Selected topics: (1) marine aspects of viscous-flow theory, (2) interfacial (internal) waves, (3) applied random processes in ocean and coastal engineering, or (4) other selected topics. May be repeated for credit. Prerequisite: approval of Department. (Spring)

276 **Water Resources Planning and Control** (3)
The parameters of water resources planning and control; economics of water resources and related natural resources; economics of water quality control; physical parameters of water resource development; water resources law. Prerequisite: approval of Department. (Fall)

277 **Industrial Waste Treatment** (3)
The nature of industry and waste generation; industrial waste characteristics; waste measurements; techniques utilized in industrial waste treatment and control; nuclear waste control; reuse of industrial effluents and sewage for industrial process water; problems associated with treatment and disposal of industrial wastes and their effects on receiving waters. Prerequisite: CE 211 or equivalent; prerequisite or concurrent registration in CE 240. (Fall)

278 **Pollution Transport System** (3)
Distribution of pollutants in natural waters and atmosphere; diffusive and advective transport; mathematics for stream pollutant deoxygenation rates; groundwater pollution transport; sediment transport; thermal transport; numerical simulation of pollutant transports in streams and estuaries. Prerequisite: CE 193, ME 131. (Fall)

279 **Unit Operations in Environmental Engineering** (3)
Lecture and laboratory. Investigation of unit processes used in water and wastewater treatment. Current literature is reviewed and experiments carried out. Prerequisites or corequisites: CE 211 and 272. (Spring, alternate years)

280 **Water Resources Systems** (3)
Water resources planning and control; water quality planning, water supply planning, comprehensive planning and management. Case studies of systems. Prerequisite: CE 276. (Spring)

281 **Special Topics in Water Resources** (3)
Selected Topics: morphometric properties of drainage basins; drainage network analysis; hydraulic geometry of streams; advanced hydraulics of alluvial channels; modeling of drainage basins; computer applications; stochastic hydrology. Prerequisite: approval of Department. (As arranged)

282 **Hydraulic Modeling** (3)
Dimensional analysis and similitude. Types of models; physical models, mathematical models. Distortions in physical models. Erodible bed models. Prerequisite: CE 193 or ME 221 or graduate standing. (Spring, odd years)

298 **Research** (arr.) (Fall and spring)
Basic research projects, as arranged. May be repeated for credit.

399–300 Thesis Research (3–3)
(Fall and spring)

310 Sedimentation Engineering (3)

Problems of erosion and sedimentation. Properties of sediment. Initiation of motion. Suspension of sediment and sediment discharge theories. Sedimentation measurements. Economic and legal aspects. Prerequisite: CE 212 or approval of Department. (Fall)

311 Mechanics of Alluvial Channels (3)

Physical processes in drainage basins and channels. Channel forms and bed forms. Hydraulics and sediment transport in alluvial channels. Design of stable channels. Qualitative and quantitative response of rivers. Channel stabilization, navigation channels. Case studies including environmental impacts. Prerequisite: CE 212 or approval of Department. (Spring)

312 Advanced Hydraulics (3)

Continuity, energy, and momentum equations. Turbulence, diffusion, and dispersion. Cavitation, waves, subsurface flow. Special problems in flow through hydraulic and marine structures. (Summer)

398 Advanced Reading and Research (arr.)

Limited to students preparing for the Doctor of Science qualifying examination. May be repeated for credit. (Fall and spring)

399 Dissertation Research (arr.)

Limited to Doctor of Science candidates. May be repeated for credit. (Fall and spring)

echanical Engineering Graduate Courses

204 Advanced Instrumentation Techniques (3)

Pressure and temperature sensors; shadowgraph, schlieren and interferometer systems; laser holography; laser doppler velocimetry; signal conditioning, use of amplifiers with shielding and grounding techniques; digital techniques; signal multiplexing; use of computers; error analysis and data handling. Lecture and laboratory. Prerequisite: approval of Department. (Fall)

215 Theory of Vibrations (3)

Damped and undamped natural vibrations, transient response and response to harmonic and periodic excitation, natural vibration of discrete and continuous systems; integral formulation of eigenvalue problems, response by modal analysis, approximate methods, influence of secondary effects and constraints, damped systems. Prerequisite: approval of Department. (Fall)

216 Structural Dynamics (3)

Methods of solving vibration problems: differential equation, Rayleigh-Ritz finite element. Free and forced vibration of structural components: straight, curved, and thin-walled beams; plates and shells; sandwich construction. Vibration of built-up structures. Structural wave motion, wave motion in periodic structures. Prerequisite: ME 215. (As arranged)

218 **Design of Floating and Submerged Marine Vehicles** (3)

Consideration of interaction between hydrodynamics, propulsion, and con figuration aspects of design of floating structures and vehicles; effects o submergence and deep submergence; hydrofoil and vertical jet action structural considerations. Prerequisite: EngS 228. (Fall)

221 **Intermediate Fluid Mechanics** (3)

The continuum, kinematics of fluids; stress tensor, strain and rate-of-strain tensor; fundamental equations of the flow of viscous compressible fluids Laplace's equations; source, sink, and doublet; vortices, Biot-Savart theo rem and the flow field of a vortex; spherical and cylindrical harmonics methods of singularity distributions, complex-variable methods; laminar flow of viscous incompressible fluids; boundary-layer concept. Prerequi site: approval of Department. (Fall)

222 **Applied Fluid Dynamics** (3)

Subsonic lifting line wing theory, direct and inverse solution of the lifting surface theory; singularity method for wing-body combination; vortex lift theory; effects of camber and twist distribution; transonic airfoils effect of wing sweep, area ruling concept; supersonic linearized wing the ory; similarity rules. Prerequisite: ME 221 or equivalent. (Spring)

223 **Aeroelasticity** (3)

Introduction to aeroelastic phenomena; structural deformations of vehicles under static and dynamic loads; vibrations of vehicle structures; static aeroelastic problems (structural deformation, divergence, control effective ness, and reversal); flutter theory and calculation of flutter boundaries aerodynamics of steady and nonsteady two-dimensional wings in sub sonic, sonic, and supersonic flow; strip theory applications of two-dimen sional aerodynamics to three-dimensional lifting surfaces; piston theory and Newtonian-flow theory. Prerequisite: ME 215, 221; or equivalent. (Fall)

224 **Fundamentals of Combustion Engines** (3)

Classification of combustion engines: air cycles, vapor cycles, externa combustion engines, internal combustion engines; rotary engines, recipro cating engines, and turbomachinery; ideal cycle analysis; engine heat losses and friction; practical cycle analysis status of computerized cycle analysis combustion and knocking; carburetion and fuel injection; mixture distribu tion; valve mechanism; ignition systems; combustion chamber; piston-en gine, rotary-engine, and turbomachinery mechanics and balance. Prere quisite: approval of Department. (Fall)

225 **Turbomachinery I** (3)

Turbine, compressor, and pump types and uses; dimensional analysis of turbomachines; cycle analysis of gas and steam turbines; energy exch change in fluid machinery; design, characteristics, and performance of turbines, compressors, and pumps; comparison of types of turbines, com pressors, and pumps. Prerequisite: ME 221. (Fall)

226 **Turbomachinery II** (3)

Aerodynamics of aerofoils, flow in cascades, axial compressor aerody namic design, axial turbine aerodynamic design, compressor and turbine

matching. Combustion fundamentals, combustion chemistry, and gas turbine combustion chamber design. Prerequisite: ME 225. (Spring)

227 Viscous Flow (3)

Exact solutions of Navier-Stokes equations; the small Reynolds number approximations, laminar boundary-layer theory and the techniques for its solution, stability of laminar flows; Reynolds theory of turbulent stresses, applications to internal and external flows, turbulent boundary-layer theory; applications to heat transfer problems; flow separation. Prerequisite: ApSc 213; and ME 221 or equivalent. (Fall)

231 Hydrodynamics (3)

Flow at large Reynolds number: vorticity dynamics, Kelvin's theorem in inviscid flow, vorticity in motions generated from rest, boundary layers, applications of the momentum theorem. Irrotational flow theory: applications of Bernoulli and momentum theorems to steady flows, flow due to a rigid body, two-dimensional motion and applications of complex variable theory, free surface flows, Froude numbers, criterion of dynamic similarity. Effectively inviscid flow with vorticity: sheet vortex, flow with swirl, vortex system of a wing. Prerequisite: ME 221 or equivalent. (Spring)

235 Compressible Flow (3)

Thermodynamics and physical properties of gases, fundamental equations of a compressible inviscid fluid, small perturbation theory, expansions in Mach number and thickness parameters, second-order shock shapes, role of entropy in supersonic flow, shock wave interactions, holograph transformation, Kármán-Tsien and other model gases, conical flows, transonic flow theory, method of characteristics, rotational nonisentropic flows. Prerequisite: ApSc 213; and ME 221 or equivalent. (Spring)

237 Energetics of Fluid Flow I (3)

Energy transformations in fluid flows. Gas dynamics of combustion. Nonuniform flow, mixing. Mechanisms of flow induction. Applications to pumping, propulsion in water, air, and space, and thrust augmentation. Prerequisite: ME 155 or equivalent. (Spring)

238 Energetics of Fluid Flow II (3)

Wave processes and their utilization. Static, dynamic, and cryptosteady pressure exchange; energy equalizers and dividers. Advanced concepts of air and marine propulsion. Discussion of various concepts of flow induction, thrust generation, and environmental control. Prerequisite: ME 237 or equivalent. (Spring)

240 Kinematic Synthesis (3)

Techniques for the analysis and synthesis of function, path, and motion generating mechanisms. Algebraic and graphical methods for the dimensional design of mechanisms having prescribed performance characteristics. Design for higher-order requirements. Computer-aided techniques for the optimal design of planar linkages using Burmester theory, complex number stretch-rotation operators, Chebyshev polynomials, etc. Review of recent developments and current research. Term project.

241 Engineering Systems Design (3)

Principles of systems design; interdisciplinary system simulation for mechanical, electrical, fluid, and thermal sciences; dynamic response of systems; mathematical model and analogy studies; optimization techniques

with computer-aided solutions. Prerequisite: approval of Department. (Spring)

242 **Advanced Mechanisms** (3)
Emphasis on spatial kinematics but with some attention to classical theorems of plane kinematics. Analysis and synthesis of mechanisms. Analytical techniques using matrices, dual numbers, quaternion algebra, finite and instantaneous screws, theory of envelopes. Applications to design of linkages, cams, gears, machined surfaces. Use of digital computers in mechanism analysis and design. Prerequisite: ME 240. (Fall of alternate years)

243 **Advanced Mechanical Engineering Design** (3)
Design of mechanical engineering systems, components, and equipment requires the integration of engineering disciplines at an advanced level. Prerequisite: approval of Department. (Fall)

246 **Electromechanical Control Systems** (3)
System synthesis, compensation, and stabilization using Bode diagrams, root locus, etc.; linear and nonlinear characterization of mechanical, electromechanical, and electronic control components. Prerequisite: approval of Department. (Fall)

247 **Fluidics** (3)
Introduction of fluidic components and systems: behavior and modeling of bistable and proportional jet devices, vortex amplifiers and sensors, passive elements, transmission lines; system synthesis, coupling effects. Survey of current applications and research. Prerequisite: approval of Department. (Spring)

*248 **Seminar: Aircraft Design I** (3)
Designing an aircraft to specifications. Regulatory requirements, state-of-the-art limitations, computer-aided design, integration of aircraft components, economic considerations, and iterations to final configuration to obtain specified mission profile. Prerequisite: approval of Department. (As arranged)

*249 **Seminar: Aircraft Design II** (3)
Aircraft design in relation to prescribed mission requirements, different configurative concepts, detail design features. Estimation of weight, size, and power of an aircraft to satisfy mission specifications; design trade-offs and compromises. Emphasis on subsonic aircraft for steady cruising flight missions. Jet-powered and propeller-driven aircraft; supersonic cruising aircraft. Prerequisite: approval of Department. (Spring)

251 **Advanced Electromechanical Control Systems** (3)
Time domain analysis and design of electromechanical control systems using state space methods and matrix differential equation techniques. Advanced stability analysis and design optimization techniques for both linear and nonlinear systems. Examples taken from practical mechanical components and systems including continuous and discrete time systems. Introduction to electromechanical switching system theory and practice. Prerequisite: ME 246. (As arranged)

254 **Intermediate Heat and Mass Transfer** (3)
Fundamentals of heat and mass transfer, its laws and properties. Conduc

* Offered at NASA-Langley Research Center; may be offered on campus when arranged.

tion equations and solutions for steady and transient cases. Convection of heat and mass. Dimensionless numbers and boundary layer concepts. Laminar, transition, and turbulent flows. Radiation in transparent media and at surfaces. Application to combustors and solar devices. Prerequisite: ApSc 213. (Fall)

355 Urban Transportation Technology (3)

An introduction to the technical evaluation of alternative transportation modes including bus, rail, and new technology. Includes system operations, energy and environmental impacts, route constraints, suspension and switching systems, life cycle costs, and measures of system effectiveness. Prerequisite: approval of Department. (Fall)

357 Energy Technology I

An overall view of energy technology, supply and demand, and the relation among energy, environment, and institutional problems. Regression analysis, forecasting of supply and demand, energy systems modeling, analysis of cycles, Second Law analysis, nuclear energy, and energy transmission. Prerequisite: approval of Department. (Fall)

358 Energy Technology II

Continuation of ME 257. Various forms of solar energy (e.g., heating and cooling, photovoltaics, wind, biomass, ocean thermal gradients), tidal energy, geothermal energy, energy and food production, energy systems design, and energy policy. Prerequisite: ME 257. (Spring)

359 Solar Heating and Cooling Systems (3)

Availability of solar energy, climatic data for solar heating and cooling. System description, solar collector, thermal energy storage, auxiliary energy source; system performance requirements. Subsystems evaluations, collector performance analysis, collector fluid loop optimization, thermal energy storage requirements. System configurations and modeling, control system requirements. Estimation of the total life-cycle costs for selected solar heating and cooling systems. Architectural features and considerations. Prerequisite: approval of Department. (Fall)

360 Heating, Refrigeration, and Air Conditioning (3)

Theoretical considerations and engineering data including psychrometrics and physiological principles. Load calculations, computer programs for design and for energy analysis. Air conditioning and heating systems; all-air, air and water, all-water systems; heat recovery and heat pump systems, central control systems. Cost estimate and economic analysis, life-cycle costing. Codes and standards. Prerequisite: approval of Department. (Spring)

361 Air Pollution I (3)

An introductory course on the generation, monitoring, and control of air pollution. Elements of the system: generation of particulate and gaseous pollutants in natural, industrial, and energy-generating systems; their transformation as they diffuse into the dynamic sun-irradiated atmosphere; assessment of their impact through monitoring and inventory of emissions sources. Effects on health and welfare on urban, regional, and global scales. Air pollution standard setting and control strategy development. Prerequisite: approval of Department. (Fall)

262 **Air Pollution II** (3)

Laboratory and field survey and assessment of air pollution problems. A variety of laboratory techniques will be used to measure actual ambient air quality, and laboratory and field sampling of pollutant levels inside and immediately outside combustion systems will be conducted. Diffusion and chemical models will be used to relate sources and sensors of air pollution. A field air pollution impact assessment project will culminate the course activity. Prerequisite: ME 261 or equivalent. (Spring)

263 **Air Pollution Control Technology** (3)

Theoretical and applied aspects of aerosol and gaseous emission control from both stationary and mobile sources. Aerosol controls: sedimentation, precipitation, filtration, and wet collection. Application of scrubbers, catalysts, and combustion modification to control of gaseous emissions from stationary sources. Special techniques for fine particulate control (fabric, electrostatics). Control of automotive emissions through engine modification, catalysts, and alternative power systems. Vapors, odors, and noise. Prerequisite: ME 261 or equivalent. (Spring)

264 **Air Pollution Seminar** (3)

Special interest and advanced topics not covered in ME 261, 262, or 263. Special lectures by individual experts. Participants will be required to conduct a special topic study for contribution to the seminar. Prerequisite: approval of Department. (Fall)

265 **Air Pollution Meteorology** (3)

Weather and motion systems of atmosphere; ground- and upper-level air conditions; atmospheric stability and inversions; atmospheric turbulence and diffusion; urban and topographic effects upon meteorological parameters; effects of meteorological parameters upon transportation and diffusion of pollutants; meteorological factors in plant location, design, and operation, and in urban planning. Prerequisite: ME 221 or equivalent. (Fall)

*270 **Aerodynamics of Flight Vehicles** (3)

Aerodynamic loads on flight vehicles, interference effects, application of aerodynamic theory to aircraft design, studies of aircraft dynamics and performance. Prerequisite: ME 222 or equivalent. (Spring)

*271 **VTOL Aircraft Technology** (3)

Fundamental principles of VTOL aircraft; hovering performance based on momentum theory; analysis of jet-induced interference effects; transition aerodynamics; theoretical stability and control and correlation with flight data; ground-effect theory and experiment; handling qualities criteria; elements of instrument approach and landing problem. Prerequisite: approval of Department. (Spring)

*272 **Powered-Lift Technology** (3)

Basic principles of powered-lift aircraft; high-lift aerodynamics; low-speed stability and control; fundamentals of internally blown and externally blown powered-lift concepts; the spanwise blowing scheme to delay wing stall; use of powered-lift for improved maneuverability at

* Offered at NASA-Langley Research Center; may be offered on campus when arranged.

fighter aircraft; aerodynamic ground effects; alleviation of noise of powered-lift systems; aerodynamic loads associated with blown flaps. Prerequisite: approval of Department. (Fall)

*273 **Principles of Automatic Flight Control** (3)

Design of aeronautical instrumentation and feedback controls; mathematical models of sensors, controllers, and actuators; theory of feedback control, stability, accuracy, and speed of response; equalization effects of nonlinearities and noise. Prerequisite: approval of Department. (Fall)

*274 **Principles of Flight Guidance** (3)

Guidance requirements for atmospheric flight; implementation of guidance systems using inertial and radio techniques in conjunction with automatic data processing. Prerequisite: ME 273. (Fall)

275 **Stability and Control of Vehicles** (3)

Derivation of equations of motion, Euler transformations and direction cosines, stability derivatives and linearization of equations of motion, stability of linear systems with application to longitudinal and lateral dynamics, Laplace transform techniques, and frequency response analysis. Prerequisite: approval of Department. (As arranged)

*276 **Mechanics of Space Flight** (3)

First- and second-order Hamilton-Jacobi perturbation theory applied to artificial satellites, von Zeipel's methods, special and general perturbation theories for third-body perturbations. Differential correction of orbits by weighted least squares and minimum variance techniques. Comparison of various filtering techniques as applied to orbit determination and other space flight parameter estimation. Prerequisite: approval of Department. (As arranged)

277 **Numerical Methods in Fluid Mechanics** (3)

Numerical solution of partial differential equations of fluid flow; finite-difference techniques for viscous and inviscid flows; stability; methods of characteristics; boundary conditions; applications in subsonic and supersonic flows. Prerequisite: ApSc 213, EngS 284; or equivalent. (As arranged)

*278 **Performance, Stability, and Control of Helicopters** (3)

Development of rotor blade theories; actuator disc, blade element, vortex theory. Hovering and climb performance, autorotation and forward flight performance. Rotor system mechanics, flapping motion of articulated and semi-rigid rotors, blade motions in plane of rotation. General performance and design considerations. Stability and control in hovering and forward flight, damping in pitch and roll, static stability with speed and angle of attack. Prerequisite: ME 222, 275. (Spring)

*279 **Special Topics in Flight Sciences** (3)

Current problems and methods in high angle of attack stability and control. Nonlinear aerodynamics in the angle of attack region above the stall. Influence of aircraft design and nonlinear aerodynamics parameters on the poststall stability and control of aircraft. Employment of current experimental techniques and development of equations pertaining to developed spin and recovery characteristics. Prerequisite: ME 275 or approval of Department. (Spring)

*Offered at NASA-Langley Research Center; may be offered on campus when arranged.

280 Intermediate Thermodynamics (3)

Thermodynamic systems; Gibbs equations; potentials, thermodynamic re lationships, equilibrium and stability. Statistical thermodynamics; prob ability and macrostates; properties of perfect gases, mixtures, and crystals Elements of kinetic theory and its application to transport properties Introduction to relativistic thermodynamics. Application to chemical re actions, thermal radiation, magnetic, electric, and solid systems. Prerequi site: approval of Department. (Fall)

281 Nonequilibrium Thermodynamics (3)

Molecular theories of gases; thermodynamic properties and Boltzmann integro-differential equation, the H-theorem and entropy; equations o state and potentials; the equation of change and velocity distribution ou side equilibrium; transport properties. Field theory. Constitutive, bal ance, and Gibbs equations. Variational principles. Application to trans port processes in engineering systems. Prerequisite: ME 280. (Spring)

282 Fossil Fuels (3)

Coal, petroleum, and natural gas. Fossil fuel reserves, methodologies of estimating and exploring for fossil fuels. Geophysical, geochemical, and satellite techniques. Prerequisite: Chem 152. (As arranged)

283 Nuclear Reactor Engineering I (3)

World energy resources and the importance of fission energy; atomic and nuclear structure; nuclear fission and chain reaction; critical mass; nuclear reactor classification; history of reactor development; nuclear reactions and radiations; radioactive decay; radiation detection, hazards, and pro tection; neutron reactions; neutron diffusion and slowing down; the criti cality condition; reflected reactors; homogeneous and heterogeneous reac tor systems; transient reactor behavior and control; description of pres surized and boiling water reactors; other reactor systems. Environmental considerations; reactor safety. Prerequisite: approval of Department. (Fall)

284 Nuclear Reactor Engineering II (3)

Energy removal; reactor coolants; reactor thermal hydraulics, radiation damage and reactor materials problems; reactor fuels; shielding; mechani cal and structural components; preliminary reactor design; fuel cycles description of nuclear reactor systems; engineered safety systems; the economics of nuclear power. Prerequisite: ME 283. (Spring)

***285 Reaction Kinetics (3)**

Theoretical aspects of kinetics of homogeneous and heterogenous reactions in gaseous and liquid systems. Prerequisite: ME 280. (Spring)

286 Special Topics in Mechanical Engineering (3)

Prerequisite: approval of Department. (As arranged)

287 Heat Conduction (3)

Conduction of heat through solid, liquid, and gaseous media; formulation and methods of analytical, numerical, and analog solutions; steady two- and three-dimensional problems, problems in unsteady heat conduction; conduction in composite regions. Prerequisite: ApSc 213 or equivalent. (Fall)

* Offered at NASA-Langley Research Center; may be offered on campus when arranged.

288 Convective Heat and Mass Transfer (3)

Heat and momentum transfer in laminar and turbulent flow; application of boundary-layer theory to problems of forced convection; the laminar boundary-layer and similarity solutions; heat convection in turbulent flow, momentum-heat transfer analogy; the influence of temperature-dependent fluid properties; convective heat transfer at high velocities; mass transfer; formulation of a simplified theory; some solutions to the conserved property equation. Prerequisite: ME 221 or equivalent. (Spring)

289 Radiative Heat Transfer (3)

Nature of thermal radiation; radiative characteristics of surfaces; thermal radiation within evacuated enclosures; configuration factors algebra; solution methods for the integral equations of radiant interchange; enclosures containing an absorbing and emitting medium; absorbing, emitting, and scattering media; combined radiation, conduction, and convection. Prerequisite: ApSc 214 or equivalent. (Fall)

***290 Kinetic Theory of Gases (3)**

Equation of state and physical properties for gas composed of discrete particles; relation of kinetic theory to thermodynamics; Maxwell distribution of molecular velocities; Boltzmann H theorem. Molecular interactions, free paths, collision rates, scattering coefficients. Introduction to diffusion, viscosity, heat conduction; imperfect gases; flow of gases at low density. Prerequisite: ME 280. (Spring)

291–92 Power Systems (3–3)

Design of thermal power system components and system optimization. Steam cycle power generation system components: steam generators, reactor coolant system, condensate and feedwater system, turbine-generator, waste heat removal. Heat balance studies, options for improved cycle efficiencies, system optimization studies, component selection and design, cooling towers, lakes and ponds. Review of safety and pollution regulations; testing, inspection, and codes. Survey of electric power system technology. Prerequisite: ME 148, 187; or equivalent. (Academic year)

293 Combustion (3)

Basic combustion phenomena. Rate processes and chemical kinetics. Chain reaction theory. Detonation, deflagration, diffusion flames, heterogeneous combustion. Combustion technology, computer modeling, and experimental measurements. Impact of pollution regulations and alternate fuels. Prerequisite: approval of Department. (Spring)

294 Wind Energy (3)

Technical and economic problems of energy extractions from wind. Examination of the morphology of conversion devices; energy extraction from a moving fluid stream; aerodynamics of rotors. Nature of the wind, its special, temporal, and terrain-dependent variables. Structural, dynamic, and electrical problems and requirements; systems tradeoffs in wind turbine design. A wind turbine will be designed. Prerequisite: approval of Department. (Fall)

295 Statistical Thermodynamics (3)

Distribution functions; Boltzmann, Bose-Einstein, and Fermi-Dirac statistics; partition functions, correspondence between classical and statistical

*Offered at NASA-Langley Research Center; may be offered on campus when arranged.

thermodynamics. Systems with negligible effects of interparticle forces perfect gases, perfect electron gas, photon gas. The Debye solid, th Einstein solid. Prerequisite: ME 280. (Spring)

296 **Special Topics in Heat and Mass Transfer** (3)
Prerequisite: approval of Department. (As arranged)

297 **Special Topics in Fluid Mechanics** (3)
Prerequisite: approval of Department. (As arranged)

298 **Research** (arr.)
Research as arranged. May be repeated for credit. (Fall and spring)

299–300 **Thesis Research** (3–3)
(Fall and spring)

310 **Mechanics of Non-Newtonian Fluids** (3)
Classification of fluids; physical properties of composite fluids; convected coordinate systems; fundamentals of constitutive equations of composite fluids; purely viscous fluids, Reiner and Rivlin theories, power-law fluids linear theory of viscoelastic fluids, Boltzmann principle, quasi-linear visco elasticity; nonlinear theory of viscoelasticity, Rivlin-Ericksen theory; vis coplastic fluids, Bingham plastic fluids, Oldroyd's analysis; viscometry and rheogoneometry; turbulent flow of suspensions and emulsions in pipes, frictional drag reduction by polymeric additives. Prerequisite: approval of Department. (Fall)

311 **Nonsteady Flow** (3)
Eulerian and Lagrangian kinematics. Fundamental equations of non-steady viscous flow. Characteristics and waves; initial and boundary conditions. Piston theory and the oscillating airfoil. Nonsteady flows with entropy production. Discontinuities, interactions, and special transients. Gasdynamics of nonsteady combustion. Analogies and applications. Prerequisite: ME 235 or ME 237 or equivalent. (Fall)

312 **Theory of Turbulence** (3)
Concept of turbulence, transition and linear theory of flow stability, experimental observations on turbulence generation, turbulent kinetic energy distribution, statistical description of turbulence, energy cascade and energy spectrum in turbulence, mean turbulent energy and Reynolds stress closure models, turbulent shear flows in free turbulence and wall turbulence, turbulence in atmospherical environment and effects on air pollution and weather systems, turbulent drag reduction. Prerequisite: ME 227. (Fall)

313 **Magnetofluidmechanics** (3)
Thermodynamics and fluid mechanics of electrically conducting liquids and gases; theory and applications; thermodynamics and transport properties of plasmas formulated; reaction kinetics and plasma reactions, fundamental equations (mass, momentum, and energy) of magneto-fluidmechanics; flow with infinite and finite conductivity, Alfven waves and wave phenomena, flow with heat transfer and friction, relativistic magnetofluidmechanics, dimensional analysis and scaling parameters, applications to MHD power generators, pumps, plasma jets and propulsion, controlled thermonuclear fusion, chemical synthesis and mineral separation. Prerequisite: ME 221 and ME 280. (As arranged)

315 Hypersonic Flow (3)

Small-disturbance theory, Newtonian theory; constant-density solution, theory of thin shock layers, flow over blunt bodies, hypersonic viscous flow. Prerequisite: ME 227. (Fall)

317 Physical Gas Dynamics (3)

Molecular and atomic phenomena in gases, intermolecular forces, specific heats, equation of state for a real gas, dynamics of dissociating gas, radiation. Prerequisite: ME 235; and ME 295 or equivalent. (Spring)

398 Advanced Reading and Research (arr.)

Limited to students preparing for the Doctor of Science qualifying examination. May be repeated for credit. (Fall and spring)

399 Dissertation Research (arr.)

Limited to Doctor of Science candidates. May be repeated for credit. (Fall and spring)

Engineering Science Graduate Courses

201 History of Technology I (3)

The characteristic technologies of Prehistory, the Ancient Near East, Greece and Rome, Byzantium and Islam, and Christian Europe. Technology is broadly defined. Emphasis is on its manifold interactions with other cultural forces. (Fall)

*202 **Advanced General Metrology (3)**

Topics in the conceptual, physical, and mathematical aspects of measurement, standards, design for precision measurement, and measurement at extreme values. Prerequisite: graduate status. (Fall—evening)

*203–4 **Probability and Statistics of Metrology (3–3)**

Probability distributions, discrete and continuous distributions; sampling; combinatorial analysis; stochastic processes; conditional probability; correlation; analysis of variance; design and analysis of experiments; Latin Square experiments; factorial experiments; block and lattice design. Prerequisite: ApSc 115 or equivalent. (Academic year—evening)

206 Technology and Human Needs (3)

Sociology of science and technology, the solar systems and earth, population, nonrenewable resources, renewable resources, energy, nuclear energy, renewable energy conversion, environment, productivity, transportation. Prerequisite: approval of Department. (Fall and spring)

207 Engineering Climatology (3)

Constitution of physical properties of earth and atmosphere, stability conditions, energy balance characteristics, atmospheric motions, storm forecasting models, tree-ring analysis, evaporation, precipitation, fog formation, soil moisture, ground frost. Prerequisite: approval of Department. (As arranged)

208 Energy Conservation (3)

Methods of conserving energy without sacrificing productivity and the quality of life. Conservation methods in the home, in transportation, in

*Offered at NASA-Langley Research Center; may be offered on campus when arranged.

industrial, manufacturing, and commercial sectors. Second law of thermodynamics from a conservation viewpoint. Construction methods for low-energy consumption in large and small edifices. Environmental effects and low-fuel consumption in ground and air transportation. Greenhouses and natural fertilizers. Prerequisite: approval of Department. (As arranged)

210 Quantitative Aspects of Social Phenomena (3)

Mathematical models presenting social phenomena. Historical review of attempts to quantify social phenomena. Population growth, birth and death rates; population diffusion; Lancaster equation; Richardson's approach; the Forrester-Meadows model. Kinetic theory formulation of peaceful co-existence. Probability distributions, characteristic functions and central limit theorem. Brownian motion approach to speculation and the stock market. Traffic flow, the statistical approach and Lighthill's method. Quality-of-life indicators and quantification of social indicators. Environmental modeling. Thermodynamics approach to self-rejuvenating systems and its application in government and organizations. Prerequisite: approval of Department. (As arranged)

212 Nonrenewable Resources (3)

Interplay of geology, engineering, and economics on resources. Role of resources in society, concepts and definitions for analyzing resource issues. Mineral commodities, their world distribution, geology, production technologies and costs, transportation systems, consumption patterns, substitutes, recycling. Environmental impacts, energy requirements, needs and problems in mineral conservation; the threat of mineral cartels. Analysis of optimistic and pessimistic forecasts of future resource depletion. Prerequisite: approval of Department. (As arranged)

213 Renewable Resources (3)

Food and fiber, solar energy and radiation, photosynthesis. Agricultural and forest biomass production, seasonal availability, collection and replanting. Substitution of renewable resources for depletable. Food-energy relationship. Biological and chemical conversion processes, direct combustion, pyrolysis, enzymatic hydrolysis, and hydrogenation. Economies of scale and life cycle cost of conversion systems. Environmental and socio-economic impacts of alternative land usage. Institutional barriers. Prerequisite: approval of Department. (As arranged)

214 Geothermal Energy (3)

Geothermal energy due to thermal gradients in the earth, fundamentals of geological gradients, geographic location of potential geothermal energy sources, comparison of methods of exploration and study of steam and hot rock systems. Generation of electricity from geothermal sources. Obtaining hot water process heat. Equipment design. Environmental effects and means of mitigating adverse conditions. Prerequisite: approval of Department. (As arranged)

215 Advanced Strength of Materials (3)

Advanced problems of stress and strength analysis of structural and machine elements: bending, torsion and buckling of thin-walled structures. Curved beams, stress-concentrations, thermal stresses, creep instability and stress relaxation, contact problems, composite elements. Prerequisite: approval of Department. (Spring)

217 Analytical Mechanics (3)

Fundamental principles, generalized coordinates, variational principles and

Lagrange's equations, nonholonomic systems, Hamilton's equations, theory of small oscillations. Prerequisite: approval of Department. (Fall)

Introduction to Continuum Mechanics (3)
Kinematics of a continuum, equations of motion, linear isotropic elastic solid, Newtonian viscous fluid, integral formulation of general principles, simple applications. Prerequisite: approval of Department. (Fall)

Theory of Elasticity I (3)
Introduction to Cartesian tensor analysis; deformation, stress, linear constitutive relations, formulation of boundary value problems, variational principles; torsion and bending of prismatical rods, plane problems in elastostatics. Prerequisite: approval of Department. (Spring)

Theory of Elasticity II (3)
Application of integral transforms and analytic function theory to solution of plane problems in static and dynamic elasticity. Introduction to three-dimensional elastostatics. Prerequisite: EngS 221, ApSc 211. (Fall, odd years)

Physical Oceanography (3)
Seawater, equations of motion, interaction between air and sea, currents, wind-waves in deep and shallow waters, long ocean waves, tides, wave-statistics, sea ice. Prerequisite: ME 221 or equivalent. (Spring)

Transformations in Materials (3)
Thermodynamics of solids, statistical interpretation of entropy, lattice defects, equilibrium in multicomponent systems, rate theory, diffusion, phase transformations, nucleation and growth, precipitation, martensitic transformations. Prerequisite: approval of Department. (Spring, odd years)

Deformation of Materials (3)
Dislocation geometry, stress field of dislocations, forces on a dislocation, dislocation reactions, dislocation dynamics, yield, plastic flow, work hardening, recovery, solid solution hardening, precipitation and dispersion hardening, mechanisms of creep, yield, and fracture. Prerequisite: approval of Department. (Fall, odd years)

Structure of Materials (3)
Space lattices, crystal structures, planes, directions, anisotropy, texture and preferred orientations, stereographic projections, Bragg's law, Laue techniques, moving crystal diffraction, Debye-Scherrer method, X-ray spectrometry, electron microscopy, bonding energy of crystals, lattice energy, lattice vibrations, free electron theory, zone theory, alloy theories, conductors, insulators and semiconductors, magnetism, resistivity, defects in metals. Prerequisite: approval of Department. (Fall, even years)

Mechanics of Composite Materials (3)
Stress-strain relationship for orthotropic materials; invariant properties of an orthotropic lamina; biaxial strength theory for an orthotropic lamina; mechanics of materials approach to stiffness; elasticity approach to stiffness; classical lamination theory; strength of laminates; statistical theory of fatigue damage for composites. Prerequisite: approval of Department. (Spring, even years)

Composite Materials (3)
Principles of composites and composite reinforcement; micromechanics and failure; interface reactions in various composites; reinforcing mate-

rials; structure of composites—fiber-reinforced polymers, filler-reinforce polymers, fiber-reinforced metals, directionally solidified alloys, dispersion strengthened metals. Prerequisite: approval of Department. (Spring odd years)

*236 **Experimental Techniques in Materials Science** (3)

Sample preparation. Optical microscopy including polarized light method phase contrast, interferometry. X-ray microscopy including Laue tech nique and Debye-Scherrer method. Electron probe microanalysis. Elec tron microscopy including electron optics, image formation and contras for scanning and transmission electron microscopy. Field ion microscopy Prerequisite: approval of Department. (Spring, even years)

237 **Environmental Effects on Materials** (3)

Aqueous corrosion, electrochemistry, electrochemical reactions, polariza tion, environmental factors, integranular corrosion, stress corrosion, high temperature corrosion, kinetics and mechanisms of corrosion, oxidation, liquid metal corrosion, irradiation effects. Prerequisite: approval of De partment. (Fall, even years)

*239 **Physical Ceramics** (3)

Crystal chemistry and the systematic study of the structure of ceramic materials; solid reactions occurring at elevated temperatures; sintering, vitrification, diffusional mechanisms and effects; reaction rate theory; elastic, anelastic, and plastic properties of ionic and covalent solids; visco elastic behavior of vitreous and vitreous-solid systems; phase equilibria of ceramic systems. Prerequisite: approval of Department. (Spring)

240 **Fracture Mechanics** (3)

Fundamentals of brittle fracture, Griffith theory and extensions, mechanics of fracture, linear elastic systems, plasticity considerations, fracture tough ness, engineering analysis, notch strength analysis with limit approach, crack propagation laws, fatigue, fracture testing, comparison of recent continuum theories. Prerequisite: EngS 221 or CE 261. (Spring, even years)

241 **Fatigue and Failure of Materials** (3)

Extreme environments: oxidation, corrosion, high temperature creep; fa tigue: cyclic hardening and softening, crack initiation and propagation, statistical analysis of strength. Prerequisite: approval of Department. (Fall, odd years)

242 **Materials Recycling and Recovery** (3)

Techniques and technologies for recovering and re-using waste materials and developing low-resource waste systems. Direct relationships of re cycling and waste reduction to energy conservation. Effect of recycling on energy and environmental impacts of alternative materials and prod ucts; legal, economic, institutional, and environmental policy aspects of recycling and waste reduction. Prerequisite: approval of Department. (Spring)

*249 **Special Topics in Materials Science** (3)

Prerequisite: approval of Department. (As arranged)

251–52 **Transportation Workshop** (3–3)

Students and staff from various disciplines are brought together for study

* Offered at NASA-Langley Research Center; may be offered on campus when arranged.

of a selected transportation topic, or for study of the land-use objectives and transportation needs of a selected urban area and a survey of pertinent information and applicable solutions. Prerequisite: approval of Department. (Academic year)

253 **Operational Control of Urban Transit Networks** (3)
(Formerly Control of Automated Transit Systems)

General discussion of the essential functions of operation and control for various systems, with emphasis on the automation of these functions. Regulation of roadway traffic flow, management of public transit fleets, and automatic control of subways and of automated guideway transit systems. Prerequisite: approval of Department. (Spring)

256 **Introduction to the Theories of Inelastic Media** (3)

Physical basis of anelasticity, viscoelasticity, plasticity, and viscoplasticity; constitutive equations of elastic and viscoelastic media; foundations of the theories of plasticity and viscoplasticity; boundary-value problems and wave propagation in inelastic media. Prerequisite: ApSc 213 or equivalent and approval of Department. (Spring, odd years)

259 **Random Vibration of Structures** (3)

Introduction to random processes; responses of linear structures to stationary and nonstationary random inputs; structural responses to earthquakes, storm waves, boundary layer turbulences, wind loads, random temperature, etc.; failure analysis of structures under random loads; first passage failure, fatigue, stress-corrosion and crack propagation under random stress histories. Prerequisite: CE 252 or ME 215 or approval of Department. (Fall)

260 **Random Process Theory in Engineering** (3)

Spectral analysis, linear system, the superposition principle; statistical prediction and probability function, Rayleigh distribution and its properties, threshold crossing problems, prediction of extreme values; statistical prediction of random vibration, application to civil and mechanical engineering. Prerequisite: ApSc 115 or equivalent. (Fall)

*263 **Atmospheric Physics for Engineers I** (3)

Atmospheric radiation: phenomenological equation of transfer; solutions to the transfer equation; optical, physical, and chemical properties of atmospheric constituents; remote sensing and the direct inversion problem; energy transfer and atmospheric structure. Prerequisite: approval of Department. (As arranged)

*264 **Atmospheric Physics for Engineers II** (3)

Atmospheric dynamics: mean structure of the atmosphere, temperature, pressure, and wind fields; mass, momentum, and energy transfer; large-scale features of atmospheric circulation; regional features of atmospheric circulation; micrometerology. Prerequisite: approval of Department. (As arranged)

270 **Theoretical Acoustics I** (3)

Basic acoustic theory in stationary and uniformly moving media; waves in infinite space; sound transmission through interfaces between layered media and between media in relative motion; sound radiation from simple solid boundaries, source and dipole fields; propagation inducts and enclosures; elements of classical absorption of sound. Prerequisite: ME 221 and ApSc 213 or equivalent. (As arranged)

*Offered at NASA-Langley Research Center; may be offered on campus when arranged.

***271 Random Process Theory I (3)**

Random processes; stationarity and ergodicity; mean-square calculus; auto- and cross-correlations and spectra; random processes in linear systems; mean-square estimation, prediction and filtering; zero and level crossings and peak distributions; applications in aerospace sciences. Prerequisite: EngS 203 or approval of Department. (As arranged)

***272 Random Process Theory II (3)**

Discrete and continuous state Markov-processes; chains, queues, diffusion, and passage problems; linear and nonlinear estimation and stochastic control; estimation of correlations and power spectra; applications in communication theory; scattering from random surfaces; stochastic linearization and stability. Prerequisite: EngS 271. (As arranged)

***273 Time Series Analysis (3)**

Harmonic analysis of deterministic and random signals; auto- and cross-correlations and spectra; periodogram, Blackman-Tukey and direct filtering methods of spectral estimation; effects of finite length and digitization; variability; coherence. Fast Fourier transform techniques; applications in modern technology. Prerequisite: EngS 271 or approval of Department. (As arranged)

274 Environmental Noise Control (3)

Introduction to the physical effects of noise and vibration on man, practical sources of noise and their control; building noise, ventilation system noise, mechanical equipment noise, aircraft noise; automobile and truck noise; factors affecting vibration levels and vibration control by structural design, damping, and isolation. Prerequisite: EngS 270, ME 215. (As arranged)

***275 Theoretical Acoustics II (3)**

General theory of sound propagation in homogeneous media, viscous and heat conduction effects; methods of solving the inhomogeneous wave equation; theory of sound radiation, sources, dipoles, quadrupoles; radiation from moving sources; scattering and diffraction of sound by obstacles; introduction to acoustics of inhomogeneous media, geometric acoustics. Prerequisite: EngS 270. (As arranged)

***276 Acoustical and Mechanical Measurements (3)**

Characteristics of signals, basic transducer elements, standards of measurements and calibrations, signal recording and processing, acoustical and vibration instrumentation, vibration exciters, vibration testing techniques, flow mechanical measurements. Prerequisite: EngS 270, ME 215. (As arranged)

***277 Physical Acoustics (3)**

Concepts of continuum mechanics and thermodynamics, wave propagation in real media, thermal viscous and relaxational attenuations, piezoelectric crystals and ultrasonics, wave propagation in rigid and deformable porous media. Prerequisite: EngS 275. (As arranged)

***278 Psychological and Physiological Acoustics (3)**

Auditory system and its response to sound, experimental methodology in psychoacoustics, subjective response to sound, environmental noise and

* Offered at NASA-Langley Research Center; may be offered on campus when arranged.

its evaluation, criteria for the prediction of noise nuisance, nonauditory system response to noise. Prerequisite: approval of Department. (As arranged)

*279 **Human Factors in Engineering** (3)

Man-machine interface, effects of physical stress on human behavior and performance, life support system, learning and conditioning of physical stress. (Spring)

*280 **Special Topics in Acoustics** (3)

Current methods and problems in acoustics. Topics chosen from such areas as aerospace noise generation and control; instruments and procedures for acoustics measurements; and responses of structures, people, and communities to noise. Prerequisite: approval of Department. (As arranged)

*281 **Advanced Programming Techniques for Engineering Mechanics Problems** (3)

Techniques for efficient construction of large computer programs for engineering systems with emphasis on fundamental structured programming principles. Application to engineering mechanics systems such as finite elements and structural optimization. Effects of CPU organization and other hardware features of computer systems at NASA-Langley on numerical computations involved in engineering systems. Organization and management of data bases for large engineering mechanics systems. Prerequisite: approval of Department. (Spring)

282 **Computer-aided Design** (3)

Fundamental concepts in the development of computational algorithms for the design of structures, machine component and assemblies, and other engineering systems. Representation of the design process and design specifications as a network of decision tables and logical flags. Optimization techniques and algorithms in design applications. Interactive computer-aided design methods based on the use of remote access computer terminals. General purpose computer programs for engineering analysis and design. Students, individually or in groups, are required to develop a small-scale general-purpose design program in an appropriate area such as structural design, machine design, urban planning, environmental quality control, etc. Prerequisite: EE 51 or equivalent, and CE 210 or equivalent, and approval of Department. (Fall)

283 **Application of Computer Graphics in Engineering** (3)

Curve-fitting techniques as applied to computer graphics; construction of a library of geometric lines and curves connecting a series of discrete points. Representation of two- and three-dimensional geometrical shapes by a set of discrete points. Automatic generation and display on CRT screen of geometrical shapes consisting of a grid of discrete points interconnected by user-selected geometric shapes. Automatic mesh generation, transformations, projections, and the concept of "hidden" lines. Use of remote computer terminals and graphic plotter equipment in interactive computer-graphics applications. Prerequisite: EE 51 or equivalent, and EngS 284 or equivalent. (Spring)

*Offered at NASA-Langley Research Center; may be offered on campus when arranged.

284 Numerical Methods in Engineering (3)

Uses of computers in engineering and science; numerical interpolation integration and differentiation; least squares approximations and application to data fitting; roots of polynomials; eigenvalue and eigenvector problems; solution of systems of linear equations; ordinary differential equations; introduction to solution of partial differential equations; applications to initial and two-point boundary value problems in engineering mechanics and other areas of engineering. Prerequisite: approval of Department. (Fall)

285 Finite Element Methods in Engineering Mechanics (3)

Formulation of the finite element method through variational principles for structural and continuum mechanics problems. Plane stress, plane strain, three-dimensional elasticity, plate bending, thermal conduction, and potential flow. Techniques of constructing and assembling characteristic elemental matrices, computer implementation of the finite element method. Prerequisite: approval of Department. (Spring)

***286 Analysis and Design of Thin-walled Structures** (3)

Statics of thin-walled beams and panels, force interplay between stiffeners and skin in the analysis and design of stiffened thin-walled structures; strength and stiffness of locally buckled stiffened structures; classification of loads and safety factors; different considerations governing the design of thin-walled structures; critical evaluation of various structural design procedures. Prerequisite: approval of Department. (As arranged)

***287 Automated Design of Complex Structures** (3)

Review of techniques for automated design including mathematical programming, fully stressed design, and optimality criteria; application of automated design techniques to stiffened and composite shell-type structures; multiple-load conditions and design constraints. Prerequisite: approval of Department. (As arranged)

288 Advanced Finite Element Methods in Structural Mechanics (3)

Formulation of various finite element models in solid mechanics. Examination of errors, convergence characteristics. Application to nonlinear and dynamic problems including large deflection, stability, and inelastic problems. Recent developments of finite element methods. Prerequisite: Engs 285. (As arranged)

289 Special Topics in Theoretical and Applied Mechanics (3)

Prerequisite: approval of Department. (As arranged)

298 Research (arr.)

Basic research projects as arranged. May be repeated for credit. (Fall and spring)

299–300 Thesis Research (3–3)

(Fall and spring)

***310 Aeroacoustics** (3)

General theory of aerodynamic sound generation and propagation, Lighthill's formulation of jet noise, similarity laws, supersonic and subsonic jet noise, boundary layer noise, fan and compressor noise, helicopter

* Offered at NASA-Langley Research Center; may be offered on campus when arranged.

noise, sonic booms. Current problems in aeroacoustics. Prerequisite: EngS 275. (As arranged)

*311 **Nonlinear Acoustics** (3)

Finite amplitude waves and waves in moving stratified media. Interaction between linear and nonlinear waves, wave propagation through nonlinear media, applications to transmission of sound through ducts with flow and absorbing walls. Prerequisite: approval of Department. (As arranged)

*312 **Theory of Random Vibration** (3)

Response of linear systems to stationary random inputs. Failures resulting from dynamic response. Response of space vehicle structures to intense noise fields, measurement, and application. Prerequisite: EngS 271, ME 215. (As arranged)

*313 **Structural Acoustic Interaction** (3)

Coupled response of structures to sound, system of infinite extent, system of finite extent, sound radiation from structure, sound transmission through structure. Panel response to turbulent boundary-layer excitation. Sound radiation from mechanically excited structure vibration. Prerequisite: EngS 270, 312. (As arranged)

314 **Advanced Numerical Methods in Engineering** (3)

Advanced methods for numerical solution to engineering problems: finite difference solutions to elliptic, parabolic, and hyperbolic equations, method of characteristics, implicit and explicit initial value methods and their stability, optimization and mathematical programming methods, numerical solutions to integral equations, selected topics for fourth-generation computers. Prerequisite: EngS 284, ApSc 213. (Spring)

315 **Introduction to Nonlinear Mechanics of Continua** (3)

Polar decomposition, invariance, isotropy, representation theorems for invariants and isotropic tensor functions; deformation, kinematics, stress, balance principles; principles for constitutive relations; applications to nonlinear elasticity and non-Newtonian fluids. Prerequisite: ApSc 212. (Spring)

398 **Advanced Reading and Research** (arr.)

Limited to students preparing for the Doctor of Science qualifying examination. May be repeated for credit. (Fall and spring)

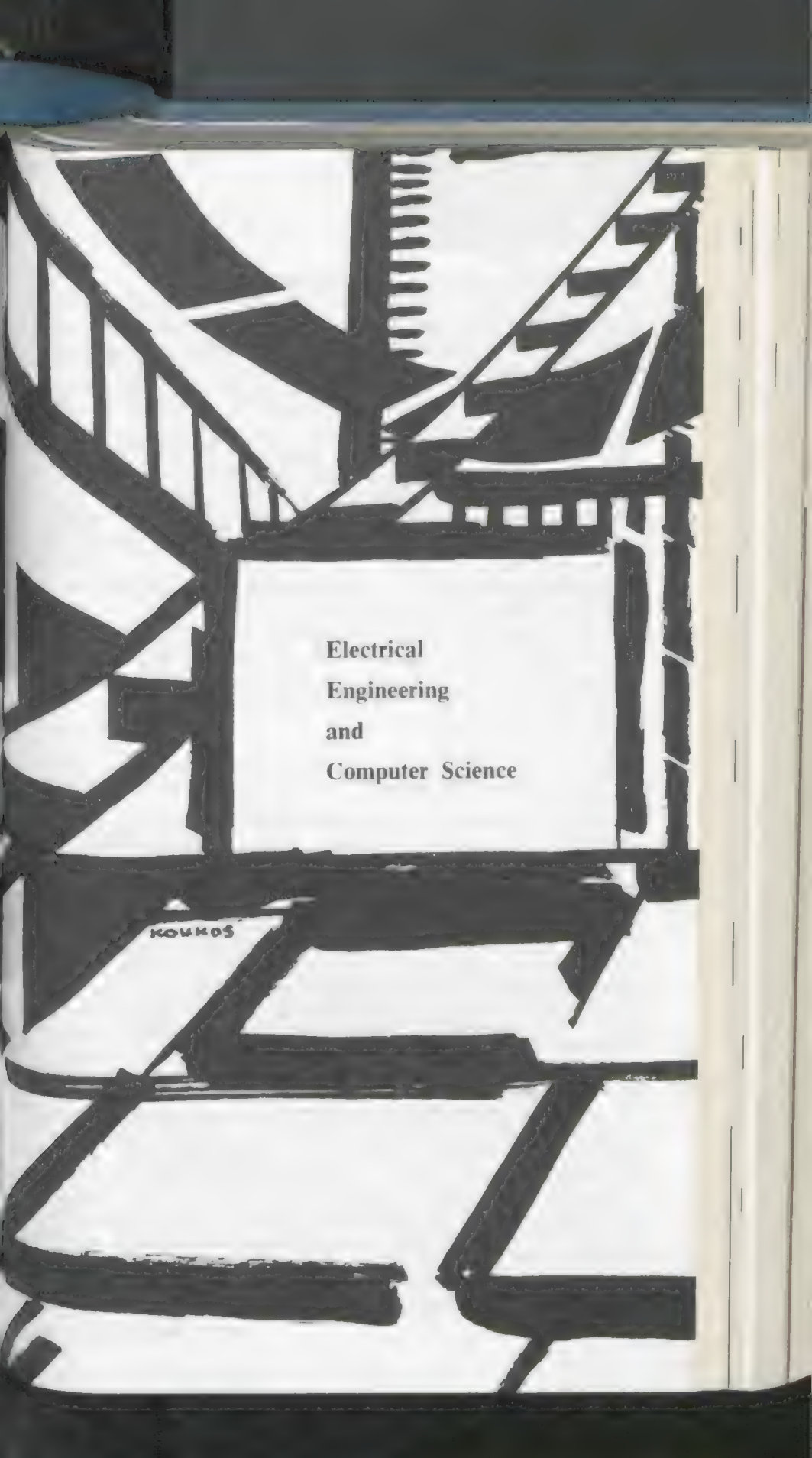
399 **Dissertation Research** (arr.)

Limited to Doctor of Science candidates. May be repeated for credit. (Fall and spring)

*Offered at NASA-Langley Research Center; may be offered on campus when arranged.


SCHOOL SUPPLIES
QUIGLEY'S INC
QUIGLEY'S
SODA




Electrical
Engineering
and
Computer Science
KOUKOS

Electrical Engineering and Computer Science

Professors M.F. Eisenberg, A.D. Friedman, R.B. Heller, W.K. Kahn, W.D. Maurer, A.C. Meltzer, R.E. Merwin *(Research)*, R.L. Pickholtz *(Chairman)*, A.M. Abd-Alla

Professorial Lecturers J.M. Acin, J.T. Coleman, D. Hogan, E.M. Lipsey, M.J. Marcus, S.A. Musa, K.R. Shah, J.E. Shore

Associate Professors E.H. Braun, J.D. Foley, H.J. Helgert, L.J. Hoffman, N. Kyriakopoulos, R.H. Lang, T.N. Lee

Adjunct Associate Professor M.H. Loew

Associate Professorial Lecturers J.G. Adler, C. Alexander, Jr., J.W. Benoit, W.T. Bisignani, H. Carus, P.J. Crepeau, A. Das, G. Frenkel, A.S. Gill, W.R. Hahn, B.M. Horowitz, J.A. Knight, D.M. LeVine, G.E. Lyon, T.P. McGarty, F.P. Pantuso, D.C. Rohlfs, F.J. Ricci, D.C. Roberts, L.A. Rubin, A. Schneider, B.P. Shah, J.L. Torres, C.C. Wang, W. Wasylkiswkyj

Assistant Professor M.B. Feldman

Assistant Professorial Lecturers G. Babaoglu, T.M. Bottegal, F.M. Brosi, J.H. Carson, N. Dresner, C. Dunham, J.B. Eisenberg, P.J. Fox, M.S. Gluck, H.A. Hung, L.M. Leibowitz, P.A. Lamb, D.H. Pugh, R. Schneider, J. Silverman, D.R. Smith, P. Volkmar, D. Woolf, A. Zachai

Senior Scientist **W. King**

Special Lecturer **P. Bock**

UNDERGRADUATE STUDY

Electrical engineering as an engineering discipline is concerned with mastering a knowledge of electricity. Electrical engineers design generators, which provide electrical energy for homes and factories, and transmission networks and the motors which utilize this power to drive machinery. By developing electromagnetic radiation, electrical engineers produce radio waves for the propagation of radio and television signals and the transmission of information via satellites. Electrical engineers design and develop electronic circuits used in communications equipment and computers. These machines have enhanced our thinking and computational capabilities to permit mankind to solve some of its most complicated problems. Microminiaturization of electronic components has permitted the development of handheld calculators and portable communication equipment. Electrical engineers are developing new instrumentation to assist the medical profession in understanding the causes of disease and to aid in preserving and prolonging life. The production of electricity from nuclear power and control of nuclear power plants is of growing concern to electrical engineers. The world's primary energy sources are limited, and electrical power has become an even more important resource. Electrical engineers are involved in the research to produce electrical energy directly from solar power.

Electrical engineering is a branch of engineering in which practical as well as theoretical and scientific aspects are integrated into a well-balanced discipline. Basic sciences such as physics and mathematics form the roots on which electrical engineering builds to create an applied science and to develop problem-solving techniques. Analysis, synthesis, and design go hand in hand. The electrical engineering curriculum provides the student with such an integrated

proach. The first two years of the curriculum are common to all undergrad- e fields in the School and develop a sound foundation of basic sciences pled with engineering sciences. The third year continues with engineering ences and begins an in-depth study of electrical engineering. The fourth r is devoted totally to electrical engineering. At the fourth year the student s a choice of either following the regular electrical engineering curriculum branching off into an area of concentration in computer science or in pre- ical engineering.

The Department of Electrical Engineering and Computer Science has modern oratory equipment, including its own computer. The student has an oppor- ity during the last year to work on individual projects where ingenuity, pled with faculty advice and guidance, allows concentration in areas such as nputers, communications, microwaves, controls, electronics, medical engineer- and circuits.

Course schedules have been arranged to accommodate the full-time, the t-time, and the co-op student. Undergraduate courses are offered once a r during the day for full-time students, and once every two years in the ning for part-time students.

bject Areas

OMMUNICATIONS

EE 143: Elements of Communication Engineering Design I
EE 144: Elements of Communication Engineering Design II

OMPUTER SCIENCE

CSci 51: Applications of Computers
CSci 52: Computers and Societal Problems
CSci 151: Introduction to Systems Programming I
CSci 152: Introduction to Microcomputers
CSci 153: Design of Switching Systems
CSci 154: Digital Computer Design
CSci 155: Introduction to Numerical Methods for Computers
CSci 156: Introduction to Systems Programming II
CSci 157: Machine and Assembly Language Programming
CSci 158: Algorithmic Methods and High-level Languages
CSci 159: Programming and Data Structures
CSci 161–62: Computer Science Laboratory

ONTROLS AND SYSTEMS

EE 172: Control Systems Design
EE 177: Electrical Energy Conversion
EE 178: Electrical Power Systems

LECTRONICS

EE 20: Introductory Engineering Electronics
EE 121: Engineering Electronics and Design
EE 122: Pulse and Waveshaping Electronic Design
EE 124: Electronic Devices

FIELDS AND WAVES

EE 31:	Fields and Waves I
EE 32:	Fields and Waves II
EE 133:	Electromagnetic Waves and Microwave Systems Design

LABORATORIES AND MEASUREMENT

EE 60:	Introductory Electrical Engineering Laboratory I
EE 61:	Introductory Electrical Engineering Laboratory II
EE 160:	Electrical Measurements and Instrumentation
EE 161–62:	Electrical Engineering Laboratory
EE 165:	Senior Design Project

MEDICAL ENGINEERING

EE 184:	Medical Engineering Instrumentation and Systems Design

NETWORKS

EE 11:	Linear Networks I
EE 12:	Linear Networks II
EE 113:	Network Analysis and Design
EE 116:	Introduction to Network Synthesis

Core Curriculum

Normally the first four semesters are common to all undergraduate fields in the School of Engineering and Applied Science.

First Semester

EE 51:	Applications of Computers (3)
Math 30–31:	Precalculus and Single-Variable Calculus I (3)*
or	
Math 31:	Single-Variable Calculus I (3)
Phys 3:	Foundations of Physics (3)
Engl 9 or 10:	English Composition: Language as Communication (3)
Elective:	Selected from humanities or social sciences (3)

Second Semester

EE 52:	Computers and Societal Problems (3)
Math 32:	Single-Variable Calculus II (3)†
Math 33:	Multivariate Calculus (3)†
Phys 14:	Introductory Mechanics and Thermal Physics (3)
Elective:	Selected from humanities or social sciences (3)

* Transfer students who have not successfully completed a college-level calculus course with a grade of *C* or better from an accredited institution, or high school students who did not take an advanced placement (AP) calculus course and receive a score of 4 or 5 on the AP test, will be required to take a one-hour locally administered math placement test at registration. This test covers algebra, trigonometry, and graphs. Students who do not place directly into Math 31 as a result of this test will be required to undertake a combined pre-calculus and calculus course (Math 30–31) during their first semester; this combined course meets five hours per week and carries three semester hours of credit if the student successfully completes the second half (Math 31) of the combined course.

† Math 32 and Math 33 may be taken in a one-semester combined course, Math 32–33.

Third Semester

ApSc 57: Analytical Mechanics I (2)
ApSc 113: Engineering Analysis I (3)
ApSc 115: Engineering Analysis III (3)
Chem 13: General Chemistry (4)
Phys 15: Elements of Electricity and Magnetism (3)
Elective: Selected from humanities or social sciences (3)

Fourth Semester

ApSc 58: Analytical Mechanics II (3)
ApSc 114: Engineering Analysis II (3)
CE 140: Materials Science (3)
EE 11: Linear Networks I (3)
Phys 16: Introduction to Modern Physics (3)
Elective: Selected from humanities or social sciences (3)

trical Engineering Curriculum

Fifth Semester

EE 12: Linear Networks II (3)
EE 20: Introductory Engineering Electronics (3)
EE 31: Fields and Waves I (3)
EE 60: Introductory Electrical Engineering Laboratory I (2)
EE 157: Machine and Assembly Language Programming (3)
Elective: Selected from humanities or social sciences (3)

Sixth Semester

CSci 153: Design of Switching Systems (3)
EE 32: Fields and Waves II (3)
EE 61: Introductory Electrical Engineering Laboratory II (2)
EE 122: Pulse and Waveshaping Electronic Design (3)
EE 152: Introduction to Digital Computers (3)
EE 177: Electrical Energy Conversion (3)
Elective: Selected from humanities or social sciences (3)

Seventh Semester

EE 121: Engineering Electronics and Design (3)
EE 143: Elements of Communication Engineering Design I (3)
EE 161: Electrical Engineering Laboratory (2)
Elective: Technical electives (9) (three courses selected from EE 113, 133, 152, 155, 178; ME 131, 187)

Eighth Semester

EE 144: Elements of Communication Engineering Design II (3)
EE 162: Electrical Engineering Laboratory (2)
EE 172: Control Systems Design (3)
Elective: Technical electives (5) (two courses selected from EE 116, 124, 160, 165, 184; ME 194)

Technical Electives

EE 113: Network Analysis and Design (3)

EE 116: Introduction to Network Synthesis (3)
EE 124: Electronic Devices (3)
EE 133: Electromagnetic Waves and Microwave Systems Design (3)
EE 152: Introduction to Microcomputers (3)
EE 155: Introduction to Numerical Methods for Computers (3)
EE 160: Electrical Measurements and Instrumentation (3)
EE 165: Senior Design Project (2)
EE 178: Electrical Power Systems (2)
EE 184: Medical Engineering Instrumentation and Systems Design (3)
ME 131: Thermodynamics (3)
ME 187: Heat Transfer Theory (3)
ME 194: Energy Conversion (3)

Computer Science Option

Computer science is a developing discipline which combines electronic design, programming of computers, and mathematics into one comprehensive area. The student learns the design and utilization of computers for scientific and business applications. Students who complete this option will be able to design both hardware and software needed for minicomputer and large-scale computing systems. The student will also be competent in hardware and software utilization of computers for control of large systems. The curriculum prepares the student for a career in computer design, applications, and utilization, or to continue study in graduate school.

Prerequisite: first four semesters as described in the Core Curriculum, see pages 118–119.

Fifth Semester

CSci 157: Machine and Assembly Language Programming (3)
CSci 158: Algorithmic Methods and High Level Languages (3)
EE 12: Linear Networks II (3)
EE 20: Introductory Engineering Electronics (3)
EE 31: Fields and Waves I (3)
EE 60: Introductory Electrical Engineering Laboratory I (2)

Sixth Semester

CSci 153: Design of Switching Systems (3)
CSci 159: Programming and Data Structures (3)
EE 32: Fields and Waves II (3)
EE 61: Introductory Electrical Engineering Laboratory II (2)
EE 122: Pulse and Waveshaping Electronic Design (3)
Elective: Selected from humanities or social sciences (3)

Seventh Semester

CSci 151: Introduction to Systems Programming I (3)
CSci 152: Introduction to Microcomputers (3)
CSci 155: Introduction to Numerical Methods for Computers (3)
CSci 161: Computer Science Laboratory (2)
Elective: Technical elective (3) (one course selected from EE 113, 12[illegible], 133, 143, 165; and one course selected from humanities or social sciences (3)

Eighth Semester

CSci 154: Digital Computer Design (3)
CSci 156: Introduction to Systems Programming II (3)
CSci 162: Computer Science Laboratory (2)
EE 172: Control Systems Design (3)
Elective: Technical elective (3) (one course selected from EE 124, 144, 165, 184)

Technical Electives

EE 113: Network Analysis and Design (3)
EE 124: Electronic Devices (3)
EE 133: Electromagnetic Waves and Microwave Systems Design (3)
EE 143: Elements of Communication Engineering Design I (3)
EE 144: Elements of Communication Engineering Design II (3)
EE 184: Medical Engineering Instrumentation and Systems Design (3)

Premedical Engineering Option

The Premedical Engineering option will permit the student who completes the work to obtain a bachelor's degree in engineering and have sufficient preparation to apply to a medical school for work toward a doctor of medicine degree. The student will also have sufficient background to work in various allied health fields, in the research and development of new electronic equipment used in medicine, or to continue as a graduate student in engineering with exceptional qualifications for medical engineering.

Prerequisite: first four semesters as described in the Core Curriculum, see pages 118–119.

Fifth Semester

BiSc 11: Introductory Biology for Science Majors (4)
EE 12: Linear Networks II (3)
EE 20: Introductory Engineering Electronics (3)
EE 31: Fields and Waves I (3)
EE 60: Introductory Electrical Engineering Laboratory I (2)
EE 157: Machine and Assembly Language Programming (3)

Sixth Semester

BiSc 12: Introductory Biology for Science Majors (4)
Chem 22: Introductory Quantitative Analysis (4)
CSci 153: Design of Switching Systems (3)
EE 32: Fields and Waves II (3)
EE 61: Introductory Electrical Engineering Laboratory II (2)
EE 122: Pulse and Waveshaping Electronic Design (3)
EE 152: Introduction to Digital Computers (3)

Seventh Semester

Chem 151: Organic Chemistry (3)
Chem 153: Organic Chemistry Laboratory (1)
EE 121: Engineering Electronics and Design (3)
EE 143: Elements of Communication Engineering Design I (3)
EE 161: Electrical Engineering Laboratory (2)

Elective:	Selected from humanities or social sciences (3)
Elective:	Technical elective (3)

Eighth Semester

Chem 152:	Organic Chemistry (3)
Chem 154:	Organic Chemistry Laboratory (1)
EE 144:	Elements of Communication Engineering Design II (3)
EE 162:	Electrical Engineering Laboratory (2)
EE 172:	Control Systems Design (3)
Elective:	Selected from humanities or social sciences (3)
Elective:	Technical elective (3)

Technical Electives

Bioc 221–22:	General Biochemistry (3–4)
BiSc 145:	Introduction to Vertebrate Embryology (4)
BiSc 148:	Histology (4)

Electrical Engineering Undergraduate Courses*

11 Linear Networks I (3)

Signals and waveforms, average value and RMS, network concepts, elements, and parameters. Kirchhoff's laws, simple networks, energy and power, differential equations of networks and their solution, phasors and steady-state analysis, measurements, impedance concepts, resonance, and filtering. Prerequisite: Phys 15, ApSc 113. (Spring—day and evening; fall—evening) (Kyriakopoulos)

12 Linear Networks II (3)

Singular functions; Laplace transform; network functions, poles and zeros; total response; time and frequency domains; convolution theorems; Fourier analysis, spectra; frequency response, Bode plots; two-port parameters. Prerequisite: ApSc 114, EE 11. (Every fall—day and evening; spring—evening) (Kyriakopoulos)

20 Introductory Engineering Electronics (3)

Various types of devices used in electronic engineering considered from the point of view of the physics of their operation and from the engineering point of view of their application to electronic circuits. Solid-state, vacuum, and gaseous devices. Primary emphasis on application of these elements in power supplies and in linear amplifiers. Introduction of design concepts through use of graphical techniques. Prerequisite: EE 11. (Fall—day and evening; spring—evening) (Heller)

31 Fields and Waves I (3)

Vector calculus, orthogonal coordinates, Coulomb's and Gauss' laws, scalar potential, dipoles, method of images, Laplace's and Poisson's equations, boundary-value problems. Prerequisite: Phys 15, 16; ApSc 114. (Every fall—day; fall, even years—evening) (Kahn)

32 Fields and Waves II (3)

Biot-Savart law, Ampere's law, vector potential, magnets, polarization and polarization currents, Faraday's law, Maxwell's equations, plane waves, and Poynting vector. Prerequisite: EE 31. (Every spring—day; spring, odd years—evening) (Kahn)

* The faculty member whose name appears at the end of each course description is the director for that course. The course director is not necessarily the instructor for any given semester.

Applications of Computers (3) (Same as CSci 51)

Introduction to the solution of problems on a digital computer using the FORTRAN or BASIC languages; data processing concepts and numerical methods using batch or interactive time-shared terminal computer systems; writing, debugging, and running programs on various digital computer systems. (Academic year—day and evening) (Bock)

Computers and Societal Problems (3) (Same as CSci 52)

Application of the digital computer to the analysis and synthesis of physical, social, cultural, economic, and environmental processes and systems. Software methods for simulation, graphic display, data reduction, and file generation and access in time-shared and batch environments using FORTRAN or BASIC. Computer-related societal problems and processes. Group projects emphasizing research and investigative techniques applied to student-selected interests. Prerequisite: CSci or EE 51 or equivalent; two years of college preparatory mathematics. (Spring—day and evening) (Bock)

Introductory Electrical Engineering Laboratory I (2)

Use, theory of design, and application of standard electronic laboratory equipment; applications of instrumentation through experiments in basic network theorems; measurement of electrical quantities and characteristics of electrical devices. Prerequisite or concurrent registration: EE 12, 20, 31. (Fall—day and evening; spring—evening) (Lee)

Introductory Electrical Engineering Laboratory II (2)

Characteristics of electronic devices and circuits; design of electronic amplifiers and measurement of their properties; experiments in support of courses in networks, fields, and electronics. Prerequisite or concurrent registration: EE 12, 32, 60, 121. (Spring—day and evening; fall—evening) (Lee)

Introduction to Computer Science (3) (Same as CSci 100)

A more intensive introductory course for students with a science, mathematics, or other quantitative background. Solution of problems on a digital computer using FORTRAN or BASIC language; data processing concepts, numerical and non-numerical methods using batch or interactive time-shared terminal computer systems. Writing, debugging, and running programs on various digital computer systems. Recommended for graduate and advanced undergraduate students in other departments. Prerequisite: Math 32 or equivalent. (Academic year—evening) (Feldman)

Network Analysis and Design (3)

Applications of matrix theory and linear graphs to electrical network analysis; network equations; signal-flow graphs; introduction to state-space techniques; solution of state-space equations on a digital computer. Network transfer functions, properties of active networks including reciprocity, stability, activity, and feedback. Use of network analysis programs such as ECAP. Prerequisite: EE 12, 20. (Every fall—day; fall, even years—evening) (Lee)

Introduction to Network Synthesis (3)

Network functions and their properties. Positive-real functions and testing for this property. Two-element, one-port network synthesis; RLC one-port synthesis; the approximation problem in the frequency domain; modern

filter theory and design; two-port ladder and lattice synthesis. Introduction to digital filters; truncation errors; realization techniques. Prerequisite: EE 113. (Every spring—day; spring, odd years—evening) (Lee

121 **Engineering Electronics and Design** (3)

Graphical analysis and design beyond the level covered in EE 20. Design of push-pull, direct-coupled and class B and C amplifiers. Design of operational amplifiers and their use in filters and electronic systems. Design of oscillators, active filters, modulators and demodulators. Design of power supplies. Prerequisite: EE 12, 20. (Every fall—day and evening) (Heller)

122 **Pulse, Digital, and Waveshaping Electronic Design** (3)

Introduction to and design of large signal circuits used in computers and communications systems. Design of logic gates and flipflops. Concepts in integrated circuit design. Design of counting and timing circuits using IC's. Pulse, sweep and waveshaping circuits. Prerequisites: EE 12 and 20. (Spring—day and evening) (Abd-Alla)

124 **Electronic Devices** (3)

Principles of operation of electronic devices used in electrical networks, communication systems, and electronic circuits. Properties of electronic devices and their applications. Modeling of devices such as diodes, transistors, and lasers. Fabrication methods of discrete components and integrated circuits. Prerequisite: EE 12, 32, 121; Phys 16. (Every spring—day; spring, odd years—evening) (Heller)

133 **Electromagnetic Waves and Microwave Systems Design** (3)

Time-harmonic Maxwell equations, complex Poynting vector, transmission lines, characteristics of common waveguides, resonant cavities, Smith chart, design of coaxial and waveguide systems, Lorentz reciprocity, simple antennas, design of linear antenna arrays. Prerequisite: EE 32. (Every fall—day; fall, even years—evening) (Kahn)

143 **Elements of Communication Engineering Design I** (3)

Signal analysis; Fourier transforms, power spectrum; principles of modulation, amplitude, frequency and pulse modulation. Comparison of analog and digital transmission. Time and frequency division multiplexing. Random signals and noise. Transmission systems for cable, radio, satellite and optical links. Prerequisite: EE 121, ApSc 114, or permission of instructor. (Fall, odd years) (Helgert)

144 **Elements of Communication Engineering Design II** (3)

Statistical theory of communication. Comparison of communication systems in noisy channels. Data communications, design of modems. Concepts of information theory. Coding for noisy channels. ARQ and forward error control. Communication protocols. Elements of traffic theory. Special topics and student project. Prerequisite: EE 143 or permission of instructor. May be taken for graduate credit. (Helgert)

151 **Introduction to Systems Programming I** (3) (Same as CSci 151)

Concepts and use of macro-assemblers and conditional assembly. Control of I/O via access methods. Job control languages and file structures. File and storage management. Use of linkers and loaders to create load modules. Prerequisite: EE 157 and 159. (Fall—day; fall, odd years—evening) (Feldman)

52 Introduction to Microcomputers (3) (Same as CSci 152)

Introduction to the structure of microprocessors and microcomputers. Representation of information in the computer. Logic and storage devices. Processor structure, registers, transfer of information and control. Programming in microcomputers. I/O structure and auxiliary electronics. Interrupt structures, direct memory access. LSI and its implication for microcomputers. Arithmeter operations. Different microcomputer architectures. Prerequisite: CSci 153 or permission of instructor. May be taken for graduate credit. **(Fall—day and evening) (Friedman)**

53 Design of Switching Systems (3) (Same as CSci 153)

Introduction to switching logic and combinational circuits. Analysis of switching devices. Minimization techniques. Number systems and codes, encoders and decoders, logic and electronic design of functional digital units. Use of LSI in logic design. Introduction to sequential circuits. Minimization of sequential machines. Design of synchronous, asynchronous and pulse sequential circuits. State-assignment and covers. (Spring —day/evening) **(Friedman)**

154 Digital Computer Design (3) (Same as CSci 154)

Logic and electronic design of functional digital units. Design of digital computer subsystems, flow of information and logical flow diagrams in timing and control signals. Design of binary and decimal, serial and parallel digital arithmetic units. Design of memory subsystems, channels, I/O, and storage subsystems. Design of the control unit of a digital computer. Introduction to microprogramming. Design of a small digital computer. Prerequisite: CSci or EE 153 or permission of instructor. May be taken for graduate credit. **(Spring—day and evening) (Abd-Alla)**

155 Introduction to Numerical Methods for Computers (3) (Same as CSci 155)

Use of numerical methods in engineering and scientific problems. Concepts of algorithm and flowchart, errors in computer and numerical methods. Introduction to numerical methods for the solution of simultaneous linear algebraic equations, roots of equations, determination of eigenvalues and eigenvectors, numerical differentiation and integration, interpolation and solution of ordinary and partial differential equations. Statistical methods for the evaluation of experimental data and correlation techniques, curve fitting. Prerequisite: ApSc 114, 115; CSci or EE 51; or equivalent. (Every fall—day; fall, even years—evening) (Meltzer)

156 Introduction to Systems Programming II (3) (Same as CSci 156)

Concepts of an operating system, monitors, dispatchers, initiators and control programs. Control of task, job stream and secondary storage. Memory management, interrupt handling, device management and scheduling algorithms. Concurrent processes. Performance evaluation in a multi-programmed environment. Prerequisite: CSci 151. (Spring—day; spring, even years—evening) **(Hoffman)**

157 Machine and Assembly Language Programming (3)(Same as CSci 157)

Architecture of various digital computers. Number systems and codes. Programming of minicomputers and multiprogrammed large computers in machine and assembly language. Techniques in structured programming. Methods of addressing and machine control for fixed and variable word-length computers. Programming on a stack architecture computer. Input-

output control on a minicomputer. Prerequisite: CSci or EE 51 or equivalent. (Fall—day and evening; spring—evening) (Feldman)

158 **Algorithmic Methods and High-level Languages** (3) (Same as CSci 158)

High-level programming languages. Comparison of computer languages and their structure. Structured programming. Introduction to compiler structure and parsing of statements. Syntax of high-level languages and their recognizers. Backus-Normal form, reentrant programming and reentrant compilers. Prerequisite: CSci 51. Prerequisite or corequisite: CSci 157. May be taken for graduate credit. (Fall—day and evening; spring—evening) (Bock)

159 **Programming and Data Structures** (3) (Same as CSci 159)

Discrete structures and data structures in computing. Use of tree structures, arrays, lists, stacks, files, strings and linked structures. Sorting, searching, hashing and merging of data files. List and string processing languages. Prerequisite: CSci 157 and 158. (Spring—day and evening) (Feldman)

160 **Electrical Measurements and Instrumentation** (3)

Electrical measurement from direct current through high radio frequencies. Measurements of current, voltage, power, resistance, capacitance, inductance, energy, phase angle, frequency, and time. Measurements of high-frequency signals including field strength, signal-to-noise ratio, impedance, and attenuation. Analog-to-digital conversion techniques and digital instrumentation for the control of measurement and instrumentation systems. Transducer characteristics and analog signal processing instrumentation. Laboratory demonstrations of measurements and instrumentation techniques. Prerequisite: EE 12, 32, 121, 152. (Spring—evening) (Heller)

161–62 **Electrical Engineering Laboratory** (2–2)

Experiments in support of courses in networks, electronics, microwaves, computers, communications, controls, and machines. The student is required to begin a design project in EE 161 and complete it in EE 162. Prerequisite or concurrent registration: EE 61, 113, 122; CSci or EE 152. EE 161 is prerequisite to EE 162. (Academic year—day and evening) (Meltzer)

165 **Senior Design Project** (2)

The student will conceive, design, construct, and test an original project in hardware or software. He will write a complete report including schematic diagrams and repair procedures, if applicable. This project cannot be used to satisfy the project required in EE 161–62 *Electrical Engineering Laboratory*. Prerequisite: senior status. (Spring—day) (Pickholtz)

172 **Control Systems Design** (3)

Mathematical models of linear systems; steady-state and transient analyses; root locus and frequency response methods; synthesis of linear feedback control systems. Prerequisite: ApSc 114; and EE 12 or ME 134. (Spring—day and evening) (Kyriakopoulos)

177 **Electrical Energy Conversion** (3)

Fundamentals of electromechanical energy conversion. Electromechanical transducers and their equivalent circuits, three-phase and single-phase a-c

rotating machines, d-c machines, rotating machines as circuit elements. Prerequisite: EE 12, 31. (Every spring—day; spring, even years—evening) (Meltzer)

178 **Electrical Power Systems** (2)

Introduction to electrical power systems; transmission and distribution of electrical power, three-phase circuits, symmetrical components, fault analysis by digital computer. Load-flow studies, economic considerations. Power station designs and synchronization of generators. Methods of generating electrical power. Prerequisite: EE 177, senior status. (Fall—evening) (Meltzer)

184 **Medical Engineering Instrumentation and Systems Design** (3)

Designed to introduce the engineering or physical sciences student to the applications of engineering design in the medical sciences; terminology of the medical profession emphasized; the physiology of the human body presented from overall systems or functional approach; survey of present-day medical measurements and consideration of those areas in which engineering design may be applied advantageously to medicine. May be taken for graduate credit. Admission by permission of instructor. (Spring—evening) (Eisenberg)

198 **Research** (1 to 3)

Applied research and experimentation projects, as arranged. Prerequisite: junior or senior status. (Fall and spring)

mputer Science Undergraduate Courses

51 **Applications of Computers** (3) (Same as EE 51)

Introduction to the solution of problems on a digital computer using FORTRAN or BASIC languages; data processing concepts and numerical methods using batch or interactive time-shared terminal computer systems; writing, debugging, and running programs on various digital computer systems. (Academic year—day and evening) (Bock)

52 **Computers and Societal Problems** (3) (Same as EE 52)

Application of the digital computer to the analysis and synthesis of physical, social, cultural, economic, and environmental processes and systems. Software methods for simulation, graphic display, data reduction, and file generation and access in time-shared and batch environments using FORTAN or BASIC. Computer-related societal problems and processes. Group projects emphasizing research and investigative techniques applied to student-selected interests. Prerequisite: CSci or EE 51 or equivalent; two years of college preparatory mathematics. (Spring—day and evening) (Bock)

100 **Introduction to Computer Science** (3) (Same as EE 100)

A more intensive introductory course for students with a science, mathematics, or other quantitative background. Solution of problems on a digital computer using FORTRAN or BASIC language; data processing concepts, numerical and non-numerical methods using batch or interactive time-shared terminal computer systems. Writing, debugging, and running programs on various digital computer systems. Recommended for graduate and advanced undergraduate students in other departments. Prerequisite: Math 32 or equivalent. (Academic year—evening) (Feldman)

151 **Introduction to Systems Programming I** (3) (Same as EE 151)

Concepts and use of marco-assemblers and conditional assembly. Control of I/O via access methods, Job control languages and files structures. File and storage management. Use of linkers and loaders to create load modules. **Prerequisite: CSci 157 and 159.** **(Fall—day; fall, odd years—evening) (Feldman)**

152 **Introduction to Microcomputers** (3) (Same as EE 152)

Introduction to the structure of microprocessors and microcomputers. Representation of information in the computer. Logic and storage devices. Processor structure, registers, transfer of information and control. Programming in microcomputers. I/O structure and auxiliary electronics. Interrupt structures, direct memory access. LSI and its implication to microcomputers. Arithmeter operations. Different microcomputer architectures. Prerequisite: CSci 153 or permission of instructor. May be taken for graduate credit. **(Fall—day and evening) (Friedman)**

153 **Design of Switching Systems** (3) (Same as EE 153)

Introduction to switching logic and combinational circuits. Analysis of switching devices. Minimization techniques. Number systems and codes, encoders and decoders, logic and electronic design of functional digital units. Use of LSI in logic design. Introduction to sequential circuits. Minimization of sequential machines. Design of synchronous, asynchronous and pulse sequential circuits. State-assignment and covers. (Spring—day/evening) **(Friedman)**

154 **Digital Computer Design** (3) (Same as EE 154)

Logic and electronic design of functional digital units. Design of digital computer subsystems, flow of information and logical flow diagrams, timing and control signals. Design of binary and decimal, serial and parallel digital arithmetic units. Design of memory subsystems, channels, I/O and storage subsystems. Design of the control unit of a digital computer. Introduction to microprogramming. Design of a small digital computer. Prerequisite: CSci 153 or permission of instructor. May be taken for graduate credit. (Spring—day and evening) (Abd-Alla)

155 **Introduction to Numerical Methods for Computers** (3) (Same as EE 155)

Use of numerical methods in engineering and scientific problems. Concepts of algorithm and flowchart, errors in computer and numerical methods. Introduction to numerical methods for the solution of simultaneous linear algebraic equations, roots of equations, determination of eigenvalues and eigenvectors, numerical differentiation and integration, interpolation and solution of ordinary and partial differential equations. Statistical methods for the evaluation of experimental data and correlation techniques, curve fitting. Prerequisite: ApSc 114, 115; CSci or EE 51; or equivalent. (Every fall—day; fall, even years—evening) (Meltzer)

156 **Introduction to Systems Programming II** (3) (Same as EE 156)

Computer software systems; concepts in the use of macro-assemblers, loaders, monitors, dispatchers, initiators, and control programs. Control of input-output in a multiprogrammed environment. Control of the task, job, job stream, and secondary storage. Job control languages. Prerequisite: CSci 158, 159. **(Spring—day; spring, even years—evening) (Hoffman)**

157 **Machine and Assembly Language Programming** (3) (Same as EE 157)

Architecture of various digital computers. Number systems and codes. Programming of minicomputers and multiprogrammed large computers in machine and assembly language. Techniques in structured programming. Methods of addressing and machine control for fixed and variable wordlength computers. Programming on a stack architecture computer. Input-output control on a minicomputer. Prerequisite: CSci or EE 51 or equivalent. (Fall—day and evening; spring—evening) (Feldman)

158 **Algorithmic Methods and High-level Languages** (3) (Same as EE 158)

High-level programming languages. Comparison of computer languages and their structure. Structured programming with high-level languages. Introduction to compiler structure and parsing of statements. Syntax of high-level languages and their recognizers. Backus-Normal form, correctness of programs, reentrant programming and reentrant compilers. Prerequisite: CSci 51 or permission of instructor. May be taken for graduate credit. (Fall—day and evening; spring—evening) (Bock)

159 **Programming and Data Structures** (3) (Same as EE 159)

Use of a macro assembler, subroutine linkages and I/O in an assembler, access methods and storage management, buffer pools and memory management, discrete structures and data structures in computing. Use of tree structures, arrays, lists, stacks, files, strings and linked structures. Sorting, searching, hashing, and merging of data files. List and string processing languages. Prerequisite: CSci or EE 157 or equivalent. (Spring—day and evening) (Feldman)

161–62 **Computer Science Laboratory** (2–2)

Experiments in support of digital logic, electronics, systems and software. Use of integrated circuits and microprocessors to develop digital systems. Interfacing I/O equipment to computers. Analog computing, hybrid computing, and A-to-D converters. The student begins a design project in CSci 161 and completes it in CSci 162. CSci 161 is prerequisite to CSci 162. Prerequisite or concurrent registration: EE 61, 122; CSci 153, 157, 158. (Academic year—day and evening) (Meltzer)

GRADUATE STUDY

The Department of Electrical Engineering and Computer Science provides the student who possesses a degree of maturity and basic knowledge one of the most stimulating experiences for advanced study. The Department offers study leading to the Master of Science, Professional, and Doctor of Science degrees. The student may study in an area of concentration such as Systems Science, Networks, and Controls; Electrophysics (electronics, fields, and waves); Communications; Medical Engineering; Computer Science (hardware, software, and systems); Computer Heuristics, Modeling, and Numerical Methods; or Energy Conversion, Power, and Transmission.

The graduate programs are formulated to take into consideration the student's individual strengths, skills, aspirations, and abilities and are determined through consultation by the student with the faculty adviser. The program should provide the student with a thorough understanding of the area of con-

centration and with a breadth of knowledge necessary in modern engineering and computer science. Each graduate student is assigned a faculty adviser on the basis of study interests, helping to develop a close student-faculty relationship during the course of the program.

Colloquium Requirement: Graduate students are required to attend several Department colloquia. These are intended to broaden the student's professional outlook and to encourage interaction with the faculty. Schedules are posted.

The graduate programs are also designed to provide an educational service to the Washington technical community. Many courses have been developed after consultation with private industry and government agencies in the area. A substantial number are offered both during the afternoon and evening and alternate from year to year.

The Department of Electrical Engineering and Computer Science has continuously kept the graduate program up to date through contact with recent developments, research generated within the Department, and the addition of experts in appropriate fields who serve as part-time and adjunct faculty.

The Department of Electrical Engineering and Computer Science periodically publishes a detailed brochure to supplement the present catalogue with information about procedures, requirements, regulations, and scope of its graduate programs. Special pamphlets describing specific programs are also available.

Areas of Concentration

COMMUNICATIONS

EE 204:	Stochastic Signals and Noise
EE 205:	Stochastic Processes in Electrical Engineering
EE 208:	Digital Image Processing
EE 241:	Information Theory
EE 242:	Coding Theory
EE 243:	Communication Theory I
EE 244:	Communication Theory II
EE 245:	Signal Detection and Estimation Theory
EE 246:	Digital Communications
*EE 247:	Communication Systems
EE 249:	Data Telecommunication Networks
EE 252:	Digital Signal Processing Techniques
EE 253:	Sonar Systems
EE 254:	Radar Systems
EE 257:	Issues in Computer Communications
*EE 258:	Radio Communication Systems I
*EE 259:	Radio Communications Systems II
*EE 277:	Space Communication Systems
EE 298:	Research
EE 299–300:	Thesis Research
*EE 345:	Advanced Detection Theory
*EE 346:	Communications Switching and Traffic Theory
EE 347:	Data Communications
EE 349:	Communications Research
EE 399:	Dissertation Research

* Doctoral students must select a minimum of three courses designated with an asterisk as part of their program in their major area.

COMPUTER HEURISTICS, MODELING, AND NUMERICAL METHODS

ApSc 211: Analytical Methods in Engineering I
ApSc 212: Analytical Methods in Engineering II
ApSc 213: Analytical Methods in Engineering III
ApSc 214: Analytical Methods in Engineering IV
CSci 158: Algorithmic Methods and High-Level Languages
CSci 201: Introduction to Computer Systems I
CSci 202: Introduction to Computer Systems II
CSci 213: Discrete Structures in Computing
CSci 214: Data Structures
CSci 219: Interactive Computer Graphics
*CSci 220: Pattern Recognition
CSci 223: Simulation and Heuristics
CSci 224: Artificial Intelligence
*CSci 232: Automata Theory
CSci 278: Analog and Hybrid Computers
CSci 281: Applications of Numerical Methods I
CSci 282: Applications of Numerical Methods II
CSci 285: Approximation of Functions and Data Representations
*CSci 286: Numerical Methods in Engineering I
*CSci 287: Numerical Methods in Engineering II
*CSci 288: Numerical Methods in Engineering III
*CSci 289: Numerical Methods in Engineering IV

COMPUTER SCIENCE (HARDWARE, SOFTWARE, AND SYSTEMS)

CSci 201: Introduction to Computer Systems I
CSci 202: Introduction to Computer Systems II
CSci 208: Computer Programming
CSci 213: Discrete Structures in Computing
CSci 214: Data Structures
CSci 216: Information Retrieval Systems
CSci 219: Interactive Computer Graphics
*CSci 220: Pattern Recognition
CSci 222: Design of User-Computer Dialogues
CSci 223: Simulation and Heuristics
CSci 224: Artificial Intelligence
CSci 227: Management Information Systems and Data Base Management
CSci 229: Security and Privacy in Computer Systems
CSci 232: Automata Theory
*CSci 237: Computing Systems
*CSci 239: Comparative Computer Systems
CSci 240: Theory and Practice of Microprogramming
CSci 243: Fault Tolerant Systems and Design Automation
*CSci 244: Data Communications
*CSci 245: Advanced Computer Systems Theory I
*CSci 246: Advanced Computer Systems Theory II
*CSci 255: Formal Languages, Correctness, and Structured Programming
*CSci 256: Design of Translators
*CSci 258: Advanced Programming Languages
CSci 263: Digital Computer Programming Systems

*Doctoral students must select a minimum of three courses designated with an asterisk as part of their program in their major area.

*CSci 267:	Operating Systems I
*CSci 268:	Operating Systems II
CSci 278:	Analog and Hybrid Computers
CSci 298:	Research
CSci 299–300:	Thesis Research
CSci 391:	Computer Science Research
CSci 399:	Dissertation Research

ELECTROPHYSICS (ELECTRONICS, FIELDS, AND WAVES)

EE 201:	Natural Modes and Transients in Electrical Systems
EE 206:	Electromagnetic Theory and Applications I
EE 207:	Electromagnetic Theory and Applications II
EE 221:	Physical Electronics I
EE 222:	Physical Electronics II
EE 223:	Optical Communications Systems
*EE 224:	Electronics of Lasers
EE 225:	Nonlinear Electronics
*EE 226:	Fiber and Integrated Optics
EE 227:	Industrial Electronics
EE 228:	High-frequency Electronics
EE 231:	Field Analysis and Potential Theory
*EE 232:	Electrodynamics
EE 233:	Microwaves and Components
*EE 234:	Electromagnetic Wave Propagation
EE 235:	Antennas
*EE 236:	Plasma Dynamics
*EE 237:	Waves in Random Media
EE 255:	Optical Processing
EE 298:	Research
EE 299–300:	Thesis Research
*EE 323:	Principles of Microelectronics
EE 329:	Electrophysics Research
EE 399:	Dissertation Research

ENERGY CONVERSION, POWER, AND TRANSMISSION

EE 201:	Natural Modes and Transients in Electrical Systems
EE 202:	Linear System Theory I
EE 212:	Advanced Network Analysis
EE 261:	Electromechanical Energy Conversion
EE 264:	Direct Electrical Energy Conversion
EE 265:	Electrical Power Production
EE 266:	Electrical Power Transmission and Distribution
EE 267:	Power Networks
EE 269:	Issues in Electrical Power Systems

MEDICAL ENGINEERING

EE 256:	Environmental Optics
EE 281:	Medical Instrumentation I
EE 282:	Medical Instrumentation II

* Doctoral students must select a minimum of three courses designated with an asterisk as part of their program in their major area.

EE 283: Introduction to Medicine for Engineers I: Physiology and Anatomy
EE 284: Introduction to Medicine for Engineers II: Clinical Medicine
EE 285: Engineering in Physical Medicine and Rehabilitation
EE 286: Sensory-evoked Potentials I
*EE 287: Computer-aided Analysis of Physiological Signals
*EE 288: Physiological Controls and Systems
*EE 289: Clinical Engineering
EE 298: Research
EE 299–300: Thesis Research
*EE 381: Bioelectric Phenomena
*EE 386: Sensory-evoked Potentials II
EE 389: Medical Engineering Research
EE 399: Dissertation Research

YSTEMS SCIENCE, NETWORKS, AND CONTROLS

EE 201: Natural Modes and Transients in Electrical Systems
EE 202: Linear System Theory I
EE 203: Linear System Theory II
EE 212: Advanced Network Analysis
*EE 213: Computer-aided Analysis and Design of Networks
*EE 215: Linear Network Synthesis I
*EE 216: Linear Network Synthesis II
EE 272: Discrete Systems
EE 273: System Optimization
*EE 274: Nonlinear Systems
*EE 275: System Identification and Adaptive Systems
EE 276: Cybernetics
EE 278: Spacecraft Systems Design
EE 298: Research
EE 299–300: Thesis Research
EE 319: Systems Science, Networks and Controls Research
*EE 371: Simulation Methods for System Analysis
*EE 372: Analysis and Control of Large Systems
EE 399: Dissertation Research

HE MASTER OF SCIENCE DEGREE PROGRAM

he Department of Electrical Engineering and Computer Science offers grad-ate study leading to the degree of Master of Science in the following areas of oncentration. Faculty members who may serve as advisers are listed after ach area.

1. Communications (Braun, Helgert, Heller, Lang, Pickholtz)
2. Computer Heuristics, Modeling, and Numerical Methods (Abd-Alla, ock, Feldman, Foley, Hoffman, Loew, Maurer, Meltzer)
3. Computer Science (hardware, software, and systems) (Abd-Alla, Bock, dman, Foley, Friedman, Hoffman, Kyriakopoulos, Maurer, Meltzer, erwin)
4. Electrophysics (electronics, fields, and waves) (Braun, Eisenberg, Heller, ahn, Lang)
5. Energy Conversion, Power, and Transmission (Kahn, Lang, Meltzer)

*Doctoral students must select a minimum of three courses designated with an asterisk as part of their program in their major area.

6. Medical Engineering (Eisenberg, Loew)

7. Systems Science, Networks, and Controls (Kyriakopoulos, Lee, Meltzer)

There are no required courses or programs of study in any of the areas of concentration. Each student formulates an individualized program in consultation with the assigned faculty adviser.

Admission

In addition to the general requirements, the applicant must have satisfied admission to graduate study (see page 27). Applicants for Master of Science programs in the Department of Electrical Engineering and Computer Science must meet the following general and specific requirements.

GENERAL REQUIREMENTS

1. The applicant must be recommended for admission by the Chairman of the Department of Electrical Engineering and Computer Science.

2. The applicant must have at least a quality-point index of 2.50 (on a scale with 4.00 maximum), or equivalent, for the last 60 semester hours of undergraduate work.

3. The applicant must be adequately prepared in the basic sciences (physics and chemistry or biology) and in mathematics (calculus through differential equations).

SPECIFIC REQUIREMENTS

In addition to the general requirements, the applicant must have satisfied through undergraduate studies the following specific requirements according to the area of concentration:

Communications

1. Networks with applications using Laplace transforms (6 semester hours—EE 11 and 12; or equivalent)

2. Electronics (3 semester hours—EE 20; or equivalent)

3. Communication theory (3 semester hours—EE 143; or equivalent)

Computer Heuristics, Modeling, and Numerical Methods

1. Computer programming using FORTRAN (3 semester hours—CSci 5; or equivalent)

2. Mathematics including partial differential equations, matrices, and eigenvalue problems)

3. Probability and statistics (3 semester hours—ApSc 115; or equivalent)

Computer Science

1. Computer programming using FORTRAN (3 semester hours—EE 5; or equivalent)

2. Computer hardware and computer software (6 semester hours—CSci 15; and CSci 157; or equivalent)

Electrophysics

1. Networks with applications using Laplace transforms (6 semester hours—EE 11 and 12; or equivalent)
2. Electronics including analysis, design, and physical theory (6 semester hours—EE 20 and 121; or equivalent)
3. Fields and waves (6 semester hours—EE 31 and 32; or equivalent)

Energy Conversion, Power, and Transmission

1. Network analysis using Laplace transforms (6 semester hours—EE 11 and 12; or equivalent)
2. Fields and waves (6 semester hours—EE 31 and 32; or equivalent)
3. Electrical energy conversion (3 semester hours—EE 177; or equivalent)

Medical Engineering

1. Network theory (3 semester hours—EE 11; or equivalent)
2. Electronic circuits (6 semester hours—EE 20 and 121; or equivalent)
3. Computer programming (3 semester hours—CSci 51; or equivalent)

Systems Science, Networks, and Controls

1. Networks with applications using Laplace transforms (9 semester hours—EE 11, 12, and 113; or equivalent)
2. Electronics (3 semester hours—EE 20; or equivalent)
3. Control theory (3 semester hours—EE 172; or equivalent)

In cases where some undergraduate deficiencies exist, the student may be required to complete 6 semester hours of undergraduate work. Normally this work must be completed prior to enrolling in graduate courses. If such deficiencies represent more than 6 semester hours, the applicant may be admitted as an unclassified student to complete a specified undergraduate program before being admitted as a graduate student.

Program of Study

Upon admission to the Master of Science degree program, the graduate student is assigned a faculty adviser. In consultation, the student and faculty adviser formulate the program of study and complete the form "Graduate Program of Studies" (Form 1) for submission to the Department Chairman for approval. This form should be completed prior to or at the student's first registration. During consultation, the student should determine whether to request permission to pursue the nonthesis option.

The program of study for the Master of Science degree will consist of a minimum of 24 semester credit hours of graduate-level courses and 6 semester hours of thesis; or, for the nonthesis option, a minimum of 33 credit hours of graduate-level courses. For the thesis option, a minimum of 12 credit hours must be in the major field of concentration, and no less than three graduate courses must be in areas other than the student's area of concentration (major). For the nonthesis option, a minimum of 21 credit hours must be in the major field, and no less than three courses must be in areas other than the student's major area.

A maximum of two courses at the 100 level may be counted toward the requirements for the degree; the course description must specify that the course may be taken for graduate credit.

Master's Comprehensive Examination

After completing the prescribed program in either the thesis or the nonthesis option, the student must pass the Master's Comprehensive Examination. The examination is scheduled twice a year (see Calendar). On the prescribed form, the student must notify the Department by the date shown on the Calendar of the student's intent to take the examination. Thereafter, requests to withdraw must be submitted in writing in advance of the examination date. Unexcused absence constitutes a forfeiture and is regarded as a failure of the examination. The examination lasts an entire day, and the student is asked to solve several problems relating to the subject matter of his major area of study. The student must demonstrate the ability to apply what has been learned while pursuing a formal graduate program. The examination is not limited to those specific courses which the student has taken, but is designed to demonstrate the student's ability to integrate material from several course areas as well as to learn from the readings.

A student who fails the Master's Comprehensive Examination on his first attempt may be re-examined one more time if approval is given by the appropriate examining committee. In the event of failure to pass the examination on the second attempt, the student's candidacy and graduate status terminate.

THE PROFESSIONAL DEGREE PROGRAM

The Department of Electrical Engineering and Computer Science offers graduate study leading to a Professional degree. This program is for students who are interested in pursuing course work beyond the Master's degree with emphasis on applied subject material rather than on research. Successful completion of the Professional degree program leads to the degrees of Engineer or Applied Scientist. Students may study for the Professional degree in the following areas of concentration. Communications; Computer Science (hardware, software, and systems); Electrophysics (electronics, fields, and waves); Medical Engineering; Systems Science, Networks, and Controls; Energy Conversion, Power, and Transmission; and Computer Heuristics, Modeling, and Numerical Methods.

There are no formal required courses or programs of study in any of the areas of concentration for the Professional degree. Each student formulates an individualized program in consultation with the assigned faculty adviser.

Admission

In addition to the School of Engineering and Applied Science requirements for admission to graduate study toward a Professional degree (see pages 31–34), applicants for the Professional degree programs in the Department of Electrical Engineering and Computer Science must meet the following general and specific requirements.

ENERAL REQUIREMENTS

1. The applicant must be recommended for admission by the Chairman of e Department of Electrical Engineering and Computer Science.

2. The applicant must have a quality-point index of at least 3.0 (on a scale 4.0 maximum), and two years of professional experience after obtaining the ster's degree.

3. The applicant must be adequately prepared in the basic sciences (physics, chemistry or biology) and in mathematics (calculus through differential ations).

PECIFIC REQUIREMENTS

In addition to the general requirements, the applicant must have satisfied ough previous studies the following specific requirements according to the as of concentration:

ommunications

Nine semester hours of statistical theory of communication and 3 semester urs of information theory—EE 204, 241, 243, and 244; or equivalent.

omputer Heuristics, Modeling, and Numerical Methods

Twelve semester hours of computer science and numerical methods at the aduate level—CSci 201, 223, 281, and 282; or equivalent.

mputer Science

Twelve semester hours of computer system design and software beyond the e of a compiler language—CSci 201, 202, 213, and 214; or equivalent.

ectrophysics

Twelve semester hours of physical electronics and electromagnetics at the aduate level—EE 201, 206, 207, and 221; or equivalent.

ergy Conversion, Power, and Transmission

Nine semester hours of electrical machine theory and networks at the grad- e level—EE 202, 261, and 266; or equivalent.

edical Engineering

Twelve semester hours of medical engineering at the graduate level—EE 281, 283, and 284; or equivalent.

stems Science, Networks, and Controls

Twelve semester hours of network system analysis at the graduate level, in- ding a knowledge of state space and linear graph theory—EE 201, 202, 203, 273; or equivalent.

An applicant who fails to meet the above specific requirements, but meets other admission requirements, may be admitted with a program of study ich is increased beyond the minimum requirements so that sufficient back- und material may be covered.

rogram of Study

pon admission to the Professional degree program, the student is assigned a culty adviser. Together they will formulate a program of study for the stu-

dent which must contain a minimum of 30 semester hours of courses, and complete the form "Graduate Program of Study." Programs of study and any subsequent changes must be approved by both the faculty adviser and the Department chairman.

The program of study for the Professional degree in the Department of Electrical Engineering and Computer Science will normally consist of a minimum of 18 semester hours of graduate-level courses in the major area of concentration and a minimum of 9 additional semester hours of graduate-level courses outside the major area but in support of the student's program. A student who is changing the major area from that studied for the Master's degree or who is lacking the specific requirements needed for admission may be required to take additional courses to make up deficiencies. Such additional work should not normally exceed 12 semester hours.

THE DOCTOR OF SCIENCE PROGRAM

The Department of Electrical Engineering and Computer Science offers programs of graduate study leading to the degree of Doctor of Science in the areas of concentration listed below. There are no formal required courses or programs of study in the areas listed. Upon admission, each student formulates an individualized program in consultation with the assigned faculty adviser.

Special fields of each faculty member are listed below.

ABD-ALLA, A.—Professor of Engineering and Applied Science.
Digital Computer Systems; Time-sharing Systems; Logical Design of Switching Circuits; Microprocessors.

BOCK, P.S.—Special Lecturer in Engineering.
Computer Science, Simulation; Programming Languages.

BRAUN, E.H.—Associate Professor of Engineering and Applied Science.
Antenna Theory; Coding Theory; Physical Electronics.

EISENBERG, M.F.—Professor of Engineering and Applied Science.
Medical Engineering; Thermography; Evoked Response; Ultrasonics.

FELDMAN, M.B.—Assistant Professor of Engineering and Applied Science.
Computer Science, Automata Theory; Programming Languages.

FOLEY, J.D.—Associate Professor of Engineering and Applied Science.
Interactive Computer Graphics; System Modeling and Measurement; Human Factors of the Man-Machine Interface; Distributed Processing and Networking.

FRIEDMAN, A.D.—Professor of Engineering and Applied Science.
Computer Architecture and Organization; Switching Theory and Logic Design; Microprocessors; Diagnosis and Fault Tolerant Design of Digital Circuits; Digital System Design Automation.

HELGERT, H.—Associate Professor of Engineering and Applied Science.
Communication and Information Theory; Coding Theory.

HELLER, R.B.—Professor of Engineering and Applied Science.
Information Processing; Computer-to-Computer Communication Networks; Satellite Communications; Electromagnetic Radiation.

OFFMAN, L.J.—Associate Professor of Engineering and Applied Science.
Computer Science; Security and Privacy; Criminal Justice Information Systems; Social Implications.

AHN, W.K.—Professor of Engineering and Applied Science.
Antennas; Wave Propagation.

ONG, W.—Senior Scientist.
Signal Processing; Applications to Radar.

RIAKOPOULOS, N.—Associate Professor of Engineering and Applied Science.
Computer-Aided Network Design; System Theory; Control Theory; Digital Filtering.

ANG, R.H.—Associate Professor of Engineering and Applied Science.
Electromagnetic Theory; Multiple Scattering; Radar Back-Scattering; Remote Sensing of Clear Air Turbulence; Optical Electronics; Stochastic Models.

EE, T.N.—Associate Professor of Engineering and Applied Science.
Networks; Linear Systems.

OEW, M.H.—Adjunct Associate Professor of Engineering.
Pattern Recognition; Medical Engineering; Signal Processing.

AURER, W.D.—Professor of Engineering and Applied Science.
Computer Science, Correctness of Programs, Analysis of Algorithms; Semantics of Programming Languages.

ELTZER, A.C.—Professor of Engineering and Applied Science.
Design of Computer Systems; Data Base Systems; Multiprocessor Systems; Hybrid Computation.

ERWIN, R.E.—Research Professor.
Microprogramming, Special-Purpose Computer Languages; Automatic Test Systems.

ICKHOLTZ, R.L.—Professor of Engineering and Applied Science.
Data Communications, Computer Communications Networks; Communications Theory.

dmission

addition to the School of Engineering and Applied Science requirements for dmission to graduate study toward the Doctor of Science degree (see page applicants for the Doctor of Science degree in the Department of lectrical Engineering and Computer Science must meet the following general nd specific requirements.

ENERAL REQUIREMENTS

1. The applicant must be recommended for admission by the Chairman of e Department of Electrical Engineering and Computer Science.
2. The applicant must have a minimum quality-point index of 3.20 (on a ale of 4.00 maximum), or equivalent, in graduate course work leading to the aster's degree.
3. The applicant must be adequately prepared in the basic sciences (physics, nd chemistry or biology) and in mathematics (calculus through differential ations).

SPECIFIC REQUIREMENTS

In addition to the above general requirements, the applicant must also satisfy through previous studies the following specific requirements according to the area of concentration (major area):

Communications

Nine semester hours of statistical theory of communication and 3 semester hours of information theory—EE 204, 241, 243, and 244; or equivalent.

Computer Heuristics, Modeling, and Numerical Methods

Twelve semester hours of numerical methods at the graduate level—CSci 201, 223, 281, and 282; or equivalent.

Computer Science

Twelve semester hours of computer system design and software beyond the use of a compiler language—CSci 201, 202, 213, and 214; or equivalent.

Electrophysics

Twelve semester hours of electronics and electromagnetic fields and waves at the graduate level—EE 201, 206, 207, and 221; or equivalent.

Medical Engineering

Twelve semester hours of medical engineering at the graduate level—EE 281, 282, 283, and 284; or equivalent.

Systems Science, Networks, and Controls

Twelve semester hours in network system analysis at the graduate level, including a knowledge of state space and linear graph theory—EE 201, 202, 203, and 273; or equivalent.

An applicant who fails to meet the above specific requirements, but meets all other admission requirements, may be admitted with a program of study which is increased beyond the minimum requirements so that sufficient background material may be covered for doctoral studies.

Program of Study

At the time of admission, the graduate student in pursuit of a Doctor of Science degree in the Department of Electrical Engineering and Computer Science is assigned a faculty adviser in the major area of study. In consultation with the adviser, the student will determine the two minor areas of study and the foreign language important in the student's field of study. Together they will formulate a program of study for the student leading to the Qualifying Examination and complete the form "Graduate Program of Study" (Form 1). Programs of study and any subsequent changes must be approved by both the faculty adviser and Department chairman.

MAJOR AREA

The program of studies for the Doctor of Science degree will normally consist of one major area of concentration and two minor areas totaling a minimum of 30 semester hours of graduate-level courses (200 and above) beyond the Master's degree level. A minimum of 15 semester hours must be taken in the

ajor area; a minimum of three courses designated with an asterisk in the t of areas of concentration must be included as part of the major area. A dent who is changing the major area from that studied for the Master's de- e or who is missing specific admission requirements may be required to take ditional courses to make up deficiencies. Such additional work should not rmally exceed 12 semester hours.

INOR AREAS

e student in consultation with the faculty adviser formulates a program of dy which includes two minor areas as part of the total doctoral studies. For ose students who take their minor area studies within the Department of ectrical Engineering and Computer Science, the following courses specify equate programs in each minor area:

ommunications
E 204; 205 or 241; 243; and 244 or 249

omputer Heuristics, Modeling, and Numerical Methods
Sci 223, 281, 282, and 285

omputer Science
Sci 201, 202, 213, and 214 or 237 or 263

ectrophysics
E 201, 206, 207, and 221

nergy Conversion, Power, and Transmission
E 202, 261, 264, and 265

edical Engineering
E 281, 282, 283, and 284

ystems Science, Networks, and Controls
E 202, 203, 212, and 273

Minor areas are not confined to the Department of Electrical Engineering nd Computer Science, but may be taken from other departments within the niversity such as Mathematics, Statistics, Operations Research, and Physics. ormally a minimum of three graduate-level courses constitutes a minor area.

UALIFYING EXAMINATION

he Qualifying Examination for doctoral students in the Department is com- osed of two parts. All incoming doctoral students must pass the first exam- ation within five semesters of their entrance. This first examination is the epartment's Master's Comprehensive Examination (MCE) in the major area. e student must demonstrate superior performance to qualify formally as a stu- ent in the Department at the doctoral level. The requirement to take this first amination is waived for a student who has received an M.S. degree from this epartment and, within two years prior to entrance, has demonstrated superior erformance on the MCE. A student may take the MCE only two times. Fail- re to show superior performance on the MCE in the major field will result n termination of the student's candidacy.

Upon completion of the student's formal program of study and after demonstrating superior performance on the MCE and passing the foreign language examination, the student is prepared to complete the Qualifying Examination. The purpose of this second part of the Qualifying Examination is to ascertain that the student's depth and breadth of background and intellectual development are adequate to support doctoral research and investigation in the major area.

This second portion of the Qualifying Examination is comprised of a written part covering the major area (one day) and each minor area (one day each). In addition and subsequent to the written examination, there may be an oral examination. The student must pass the entire second part of the Qualifying Examination. A candidate who fails any portion of the Examination on the first attempt may take those portions of the Examination one more time if approval is given by the appropriate examining committee. Failure to pass the Qualifying Examination will terminate the student's candidacy in the doctoral program.

The questions on the Qualifying Examination are not limited to those specific areas in which the student has taken course work, but are designed to demonstrate the student's ability to integrate the material from several course areas as well as from individual study and readings. Hence, the student should be familiar with the contemporary work of the current journals and the contents of the books on the particular reading lists in the areas of examination as well as those used in the course work.

After successfully completing the qualifying examination, the student makes arrangements for the assignment of a research director, who selects an appropriate advisory committee. The duties of the advisory committee are to be aware of the student's dissertation development and, in conjunction with the research director, to give guidance to the student. After the student completes his dissertation, the advisory committee will become the examining committee with the addition of at least one new person.

Electrical Engineering Graduate Courses*

201 Natural Modes and Transients in Electrical Systems (3)

Transient response and natural modes of electrical systems; techniques for analyzing systems with periodic and aperiodic inputs and outputs; Fourier and Laplace transforms. Inversion, integration in the complex plane. Sampling; discrete systems, Z-transforms; applications. Prerequisite: graduate status. (Fall and spring—evening) (Heller)

202 Linear System Theory I (3)

Graph theory and its application to networks and systems; system description in time and frequency domain; linear spaces and linear operators; mathematical representation of linear systems; analytical and computer solutions of the state equations; transient and steady-state response. Prerequisite: graduate status. (Fall—evening) (Kyriakopoulos)

203 Linear System Theory II (3)

System properties; controlability and observability of linear systems; sensitivity and stability analyses. Irreducible realizations of rational transfer-

* The faculty member whose name appears at the end of each course description is the director for that course. The course director is not necessarily the instructor for any given semester.

function matrices; canonical forms, state feedback, and state estimators. Linear composite systems. Prerequisite: EE 202. (Spring—evening) (Kyriakopoulos)

304 **Stochastic Signals and Noise** (3)

Probability, random variables, characteristic functions; transformations of random variables and applications; sequences of random variables, linear mean-squared estimation; stationary estimation, stationary random processes, correlation functions, power spectrum; output of linear systems with stochastic inputs; Gaussian processes. Applications drawn for communications, control theory, computer science. (Fall and spring—evening) (Lang)

305 **Stochastic Processes in Electrical Engineering** (3)

Markov chains, state classification, Kolmogorov equation; applications to probabilistic finite-state machines. Birth-death process, applications to queuing theory, buffer problems, and the design of communication nets. Continuous state processes, diffusion processes, passage times, and estimation problems. Estimation and power spectra. Stochastic difference and differential equations. Applications to communication theory, control theory, computer science, and propagation theory of random media. Prerequisite: EE 204 or equivalent. (Spring—evening) (Lang)

306 **Electromagnetic Theory and Applications I** (3)

Brief review of vector-phasors and Maxwell's equations, electromagnetic potentials, power and energy; plane waves, frustrated total reflection, skin effect, anisotropic media; solution of radiation problems in the Kirchoff approximation; elementary applications. Prerequisite: EE 133 or equivalent. (Fall—evening) (Lang)

307 **Electromagnetic Theory and Applications II** (3)

Introduction to advanced techniques for problems in electromagnetics; leaky waves and complex wave-types, stationary phase and steepest descent approximations for integrals in the complex plane. Discrete and continuous spectra. Application to optical fibers, surface and leaky wave antennas, ground wave propagation. Prerequisite: EE 201 or equivalent, EE 206. (Spring—evening) (Lang)

308 **Digital Image Processing** (3)

Properties of images and visual systems. Picture description, sampling and quantization. One- and two-dimensional image transform techniques including Fourier, Cosine and Hadamard. Methods of image enhancement and restoration. Image coding and data compression techniques. Automated image analysis and recognition. Prerequisite: EE 204. Spring—evening) (Loew)

312 **Advanced Network Analysis** (3)

Network theorems, network functions, relationship of parts of network functions; network properties, realizability and causality concepts; computer-aided network analysis. Prerequisite: EE 201, 202; or equivalent. (Spring, odd years—evening) (Kyriakopoulos)

313 **Computer-aided Analysis and Design of Networks** (3)

Description and use of network analysis programs such as ECAP, CORNAP, and NASAP. Algorithmic methods for time and frequency domain analysis of networks using a digital computer, numerical solution

of state equations, fast Fourier transform, network design by optimizing searches on digital computers, synthesis of electrical networks using unconstrained optimization techniques in the time domain, network design through approximation such as Fourier series, Chebyscheff functions, and Padé approximation. Prerequisite: EE 51, 212. (Fall, odd years—evening) (Kyriakopoulos)

215 Linear Network Synthesis I (3)

Properties and testing of positive real functions. Synthesis of LC, RL, RC one-port networks. Brune, Bott-Duffin, Miyata, Kuh, and Darlington synthesis techniques. Introduction to two-port ladder and lattice synthesis. Three-terminal RC network synthesis approximation in the frequency and time domains. Prerequisite: EE 202 or permission of instructor. (Fall, even years—evening) (Lee)

216 Linear Network Synthesis II (3)

Advanced topics in passive one-port and two-port synthesis. Introduction to n-port synthesis. Active network synthesis using negative resistance, controlled sources, NIC, gyrator, operational amplifiers, and circulators. Synthesis of distributed integrated networks. Computer-aided network optimization. Prerequisite: EE 215. (Spring, odd years—evening) (Lee)

221 Physical Electronics I (3)

Theoretical principles underlying the operation of electronic devices; classical mechanics and classical statistical mechanics, the quantum theory, wave and matrix mechanics, quantum statistics. Prerequisite: EE 207 or equivalent. (Fall—evening) (Braun)

222 Physical Electronics II (3)

The Boltzmann transport equation, band theory of solids, time-dependent perturbation theory, group theory. Applications to semiconductor and other solid-state devices such as transistors, tunnel diodes, masers, and lasers. Prerequisite: EE 221. (Spring—evening) (Braun)

223 Optical Communications Systems (3)

Optical communication channels; survey of laser sources; modulation; line-of-sight links; system models and analysis; detection, photoemitters, photodiodes, and photoconductors; noise mechanisms and signal-to-noise analysis; optical fiber waveguides, electromagnetic field description of material, waveguide, and modal dispersion; optic fiber cabling, repeaters, and systems analysis; integrated optic components. Prerequisite: EE 207, 243. (Spring—evening) (Kahn)

224 Electronics of Lasers (3)

Basic concepts from quantum mechanics; Einstein coefficients; inversion and pumping mechanisms; rate equations. Resonators, He-Ne laser; organic dye lasers; injection lasers. Nonlinear interactions in lasers. Prerequisite: EE 222 or equivalent. (Fall, even years—evening) (Kahn)

225 Nonlinear Electronics (3)

Analysis and design of electronic components and systems operating as switching, sweeping, gating, and pulse generators; study of multivibrators, negative resistance devices and amplifiers, nonlinear operation of oscillators. Prerequisite: EE 201 or equivalent. (Fall—evening) (Heller)

236 Fiber and Integrated Optics (3)

Single-mode and multimode propagation in stepped-index and gradient-index optical fibers: scattering and attenuation characteristics of fibers, phase velocity, group velocity, impulse response, energy transport, ray tracing, Goos-Haenchen shift, Hamiltonian formalism; directional couplers, modulators, and deflectors in fibers and surface films; coupled-mode theory. Prerequisite: EE 223 or equivalent. (Spring, odd years—evening) (Kahn)

237 Industrial Electronics (3)

Applications of electronic devices in industry; continuous and sampled control systems; induction and dielectric heating; timing and counting circuits; reliability and automatic checking equipment; digital control of machine tools. Prerequisite: EE 201 or equivalent; and graduate status. (Spring, odd years—evening) (Heller)

238 High-frequency Electronics (3)

Design and analysis of the operation of electron-tube, solid-state, crossed-field, space-charge wave, and quantum maser oscillators and amplifying devices that lay the foundation of modern communication systems. Prerequisite: EE 207 or equivalent. (Spring—evening) (Heller)

231 Field Analysis and Potential Theory (3)

General study of the theory of potentials as used to facilitate solution of problems in electromagnetic theory, mechanics, thermodynamics, optics, and gravitation. Emphasis on mathematical methods such as Green's functions, variational methods, principal axis transformations, and multi-dimensional Fourier transforms. Prerequisite: EE 207. (Fall, even years—evening) (Heller)

232 Electrodynamics (3)

Special theory of relativity and the Lorentz transformation; Minkowski formulation. Maxwell's equations in the context of special relativity, electromagnetic potentials, and stress tensors. Lagrangian and Hamiltonian formulations, radiation from moving charges. Introduction to quantum electrodynamics. Prerequisite: EE 207. (Spring, even years—evening) (Braun)

233 Microwaves and Components (3)

High-frequency transmission lines and guided systems; matching techniques; scattering parameters; transfer parameters; directional couplers; cavity resonators; Faraday rotation; ferrite isolators and circulators. Prerequisite: EE207. (Fall—evening) (Kahn)

234 Electromagnetic Wave Propagation (3)

Retarded time scalar, vector, and Hertz potential. Dipole and dipole array fields; Mie theory of electromagnetic scattering by spheres. Propagation in electrically and magnetically anisotropic media such as dielectric crystals, space-charge plasmas, and ferrites. Wave propagation in inhomogeneous media; Liouville transformation, Lagrange's variation of parameters, WKB solution, invariant imbedding techniques. Propagation in stochastic and dispersive media. Prerequisite: EE 207. (Fall, odd years—evening) (Lang)

235 Antennas (3)

General solution of Maxwell's equations in terms of current sources, th far field approximations, radiation from current distributions, field equi alence theorems, the geometrical optics approximation, aperture ante nas, receiving antennas, the theory of arrays, and applications to specifi antennas and antenna types. Prerequisite: EE 207. (Spring—evening (Kahn)

236 Plasma Dynamics (3)

Study of the interaction of fluids with electromagnetic fields. Generalized Navier-Stokes and energy equations, magnetogasdynamic and magneto hydrodynamic approximations, boundary-layer theory, statistical theory of turbulence, generalized Von Karman-Howarth equation, Boltzmann transport equation. MHD generators and devices. Prerequisite: EE 207 (Spring, even years—evening) (Braun)

237 Waves in Random Media (3)

Propagation and scattering of electromagnetic, optical, and acoustic waves in random media, scattering from rough surfaces and randomly distributed particles, turbulence. Applications to propagation through rain and fog. Laser beam scintillations, remote sensing, and communication channel modeling. Computer simulation by Monte Carlo techniques. Prerequisite: EE 204, 207. (Fall, odd years—evening) (Lang)

241 Information Theory (3)

Measure of information, noiseless coding; communication channels, channel capacity, the noisy channel coding theorem; bounds on the performance of communication system; the Gaussian and binary symmetric channel; feedback communications systems; rate-distortion theory. Prerequisite: EE 204. (Fall—evening) (Helgert)

242 Coding Theory (3)

The PCM Communication System, mathematics of coding; groups, rings, and fields; linear codes: parity and generator matrices, syndromes error correction and deletion capability, minimum distance; performance bounds of linear codes, Hamming and Golay codes, polynomial algebras and Galois fields, shift-register implementation; cyclic codes: implementation and performance; BCH codes: encoding, decoding, minimum distance, the BCH decoding algorithm, burst-correction codes, convolutional codes, sequential and Viterbi decoding of convolutional codes. (Spring—evening) (Helgert)

243 Communication Theory I (3)

Optimum receivers for vector channels and for the additive white Gaussian noise channel; correlation detectors, matched filters; coherent and noncoherent detection and their error probabilities for simplex, orthogonal, and coded systems; bounds on the performance of communications in Gaussian noise; comparison of communications systems. Prerequisite: EE 204 or equivalent. (Fall—evening) (Pickholtz)

244 Communication Theory II (3)

Schemes for efficient signaling for data sequences; effects of quantizing at the receiver. Practical implementation of orthogonal and simplex coded communication. Convolutional codes; bounds on performance decoding by sequential (Zigangirov-Jelinek, Fano) and MAP (Viterbi)

algorithms. Fading and dispersive channels, diversity techniques and their performance. Topics from analog communications. Prerequisite: EE 243. (Spring—day and evening) (Pickholtz)

245 **Signal Detection and Estimation Theory** (3)

Statistical detection theory, hypothesis testing, sequential detection, estimation theory, maximum likelihood and Bayes methods, estimation of signal parameters and continuous wave forms, Wiener and Kalman filters, applications to the design of optimum receivers, adaptive systems. Prerequisite: EE 241, 244; or equivalent. (Fall—evening) (Pickholtz)

246 **Digital Communications** (3)

Digital transmission for data, voice, and video. Modern practice in data communication; voice digitization, PCM, delta modulation, linear predictive coding. Bounds for digital signaling, pulse dispersion and intersymbol interference. Nyquist criteria, eye openings; adaptive equalizers, decision feedback, partial response techniques. Regenerative repeaters; timing extraction, synchronization and jitter. Transmission codes. Multiplexing and framing. Error control for data. Digital switching and integrated digital networks. Topics from spread spectrum and secure communications. Prerequisites: EE 241, 244 or equivalent. (Spring—evening) (Pickholtz)

247 **Communication Systems** (3)

Phase-locked loop dynamics noise behavior and optimization. Parameter estimation theory and Wiener filters with application to optimum demodulation of analog waveforms (DSB-AM, SSB-AM, FM). Partially coherent digital demodulation. Comparative analysis of modulation systems. Frequency acquisition and synchronization. Selected topics in channel impairments and multiple access. Prerequisite: EE 241, 244. (Fall—evening) (Pickholtz)

249 **Data Telecommunication Networks** (3)

Design and analysis of computer-communication and terminal-oriented data networks. Line, message, and packet switching. Traffic theory for data. Queuing models for store and forward data communications. Optimization for minimum message delay and cost. Statistical multiplexors (concentrators), topological design problems, and algorithms; network control and protocols. Prerequisite: EE 205 or equivalent. (Fall—evening) (Pickholtz)

*250 **Telecommunication Systems Concepts** (3)

Essential elements of an electrical communication system, speech, TV, and data signals; spectrum, bandwidth, sampling. Amplitude, frequency, and pulse code modulation and comparative performance. Multiplexing schemes, communication quality standards, and objectives. Signal power, noise power, distortion, and channel capacity. Probability, traffic theory, reliability, voice, TV, and data transmission. Telecommunication, microwave radio, cable, and satellite communications systems. (As arranged) (Pickholtz)

*251 **Survey of Telecommunication Systems** (3)

Design of a communications link for voice, TV, and data. Loading; the switched telephone network. Transmission system layout and major de-

*EE 250 and 251 cannot be applied toward a graduate degree in the School of Engineering and Applied Science.

sign considerations. Overall system design of microwave radio syste Radiowave propagation fundamentals. Satellite communications, facto affecting the choice of orbit and orbital separation of satellites, satell transponder. Major design consideration and values of significant par meters for a typical satellite communications link. Overall design of cable communication system. Digital transmission and terminals. Wid band data transmission. Frequency allocation. (As arranged) (Pic holtz)

252 **Digital Signal Processing Techniques** (3)

Digital signal processing and data reduction techniques; applications t communications, controls, image enhancement, radar, and speech process ing. Least-squares fitting of polynomials; sampling and quantization. Re cursive and nonrecursive digital filter design. Generation and shaping o pseudo-random noise. Estimation of correlation functions and spectra densities. Digital processing for Kalman-Bucy filters. Extraction of signal and timing from noise. Fast Fourier and Hadamard transforms. Software and hardware implementation of signal processing algorithms. Prerequi site: EE 51 or equivalent; EE 204; and graduate status. (Fall—eve ning) (Helgert)

253 **Sonar Systems** (3)

Underwater sound propagation; transducer and transducer arrays; detec tion, localization, and tracking techniques; array processing; time compres sion correlation and digital processing of signals; effects of nonhomo geneous noise fields; applications to navigation and communications in the ocean environment. Prerequisite: EE 204. (Fall—evening) (Hel gert)

254 **Radar Systems** (3)

The radar equation, range and resolution limits; MTI radars; detection and estimation techniques; clutter characteristics and detection in clutter; signal design; ambiguity functions; Doppler radar; phased arrays; synthetic aper ture techniques; digital and optical processing and computer control. Ap plications. Prerequisite: EE 206, 244. (Spring—evening) (Helgert)

255 **Optical Processing** (3)

Fourier transforms by diffraction of light, optical spectrum analysis, opti cal memories and systems, holography and holographic techniques, prop erties and techniques for photographic reproduction. Prerequisite: EE 201. (Fall—evening) (Kahn)

256 **Environmental Optics** (3)

Distribution of radiation: power converting and transferring systems; UV, luminous, IR spectral sources; daylight; moonlight; luminaries. Environ mental boundaries—transmission, reflection, diffusion, refraction, diffrac tion, dispersion, bleaching, phototropy, polarization. Simulation of organ ismic responses: response definition—physiological, overt behavioral, per ceptual, cognitive. Stimulus-response correlation model; correlating meas urement concepts. (Spring—evening) (Eisenberg)

257 **Issues in Computer Communications** (3)

Fundamentals of data communications, systems, integrating computers and telecommunications, modems, multiplexers, concentrators and lines. Networks of computers: distributed and centralized. Network organiza tion: circuit-switched, store-and-forward, and packet-switched. System de-

sign considerations; management factors; economic and regulatory issues; changes in technology; effect on systems cost performance; regulation, value-added networks. (Spring—evening) (Pickholtz)

258 **Radio Communication Systems I** (3)

Analysis and design of microwave communication systems for terrestrial, satellite, and over-the-horizon scatter radio channels. Propagation effects and channel characterization including refraction, reflection, multipath, scattering, and absorption. Effects of earth curvature and characteristics of over-land and over-water propagation. Antenna considerations including gain, directivity, polarization, and antenna patterns. Frequency and time-division multiplexing and modulation techniques. Effects of noise, interference, and fading. Diversity techniques. Prerequisite: EE 206, 244. (Fall—evening) (Lang)

259 **Radio Communication Systems II** (3)

Morphology of the ionosphere, propagation of ionspherically reflected radiowaves, anomalous ionospheric propagation mechanisms, linear antenna structures, atmospheric noise, digital modulation techniques, non-Gaussian channel performance, diversity, fading channel error control, typical VLF, LF, and HF system design. Prerequisite: EE 258 or permission of instructor. (Spring—evening) (Lang)

261 **Electromechanical Energy Conversion** (3)

Characteristics of synchronous machines, synchronous reactance, reactance theories, synchronizing generators and parallel operation of machines, characteristics of asynchronous machines, machines as circuit elements, steady-state and dynamic performance of alternating current machines. (Fall—evening) (Heller)

264 **Direct Electrical Energy Conversion** (3)

Theory and practice for direct production of electricity using solar cells, thermionic converters, fuel cells, and batteries. Concepts of solid state energy bands, work function and conversion efficiency, and limitations. (Spring—evening) (Heller)

265 **Electrical Power Production** (3)

Production of electrical power from primary energy sources. Use of hydrocarbon fuels in the production of steam; hydroelectric generation and tidal variations as primary energy. Geothermal energy, nuclear fission, magnetohydrodynamics, fusion and solar concentrators as primary energy sources. (Fall, odd years—evening) (Heller)

266 **Electrical Power Transmission and Distribution** (3)

D.C. and multi-phase high voltage transmission line parameters, voltage, current, impedance and standing waves. Shunt and series passive and active user loading; current surges, interference, protection and filtering; power factors; substation design and distribution systems. (Spring, even years—evening) (Heller)

267 **Power Networks** (3)

Symmetrical components, short and opened circuit analysis of power networks, stability of electrical grids, fault analysis, network reliability, frequency control, load flow analysis. Prerequisite: permission of instructor or advisor. (Fall, even years—evening) (Heller)

269 Issues in Electrical Power Systems (3)

Electrical effects of overhead transmission lines, corona effects, radio and television interference, audible noise emission, electric and magnetic fields and ozone emissions. (Spring, odd years—evening) (Heller)

272 Discrete Systems (3)

Sampling processes and theorems; Z-transforms and modified Z-transforms; responses of discrete systems using transformation techniques and state equations; stability criteria; design of digital controller for discrete systems. Prerequisite: EE 202 or equivalent. (Spring, even years—evening) (Kyriakopoulos)

273 System Optimization (3)

Parameter optimization problems; theory of minima and maxima. Optimization problems for dynamic systems; calculus of variations; the maximum principle and the Hamilton-Jacobi equation. Optimization problems with constraints; optimal feedback systems. Numerical solution of optimal problems. Prerequisite: EE 203 or equivalent. (Fall—evening) (Lee)

274 Nonlinear Systems (3)

Definition of linear and nonlinear systems; introduction to approximate analysis of nonlinear systems—describing functions, Krylov and Bogoliubov's asymptotical method and Tsypkin's locus. Forced oscillations—jump resonance. Stability analysis—Liapunov's criterion, Luré's problem, and Popov's method. Prerequisite: EE 203. (Spring, odd years—evening) (Lee)

275 System Identification and Adaptive Systems (3)

Introduction to the adaptive problem and practical applications. Determining the mathematical representation of systems—the identification problem. Optimal estimation of states in the presence of uncertainties. Adaptive systems. Prerequisite: EE 203, 204; or equivalent. (Fall, even years—evening) (Lee)

276 Cybernetics (3)

Principles of machines or mechanisms made by men or nature with regard to their ways and forms of possible behaviors: regular, determinate, or reproducible; fundamental concepts of finite differences; changes and transformations as sets of transitions, leading to stability and feedback. statistical concepts of complex systems and blackbox theory; Shannon's information theory; regulation and control of mechanisms. Prerequisite: EE 204 or equivalent. (Fall, odd years—evening) (Helgert)

277 Satellite Communication Systems (3)

(*Formerly Space Communication Systems*)

Theoretical and applications aspects of satellite communications. Modulation and multiple access techniques. Link design. Satellite transponders and antenna systems. Ground stations. Random access techniques and satellite packet communications. Prerequisite: EE 244. (Fall—evening) (Pickholtz)

278 Spacecraft Systems Design (3)

Space environment; structure, propulsion, control, and instrumentation of spacecraft—launch, orbit, transit, and re-entry problems; bioastronautic considerations. Prerequisite: graduate status. (Spring, even years—evening) (Heller)

281 Medical Instrumentation I (3)

Theory of measurements in biological areas, techniques for electronic

measurements on biological specimens, current problems in medical metrology stressing electronic systems. Prerequisite: EE 283 or permission of instructor. (Fall—evening) (Eisenberg)

Medical Instrumentation II (3)

Medical telemetry systems, medical use of the computer, engineering techniques in patient treatment, principles of good medical instrumentation. Prerequisite: EE 283 or permission of instructor. (Spring—evening) (Eisenberg)

Introduction to Medicine for Engineers I: Physiology and Anatomy (3)

Designed to acquaint the engineering student with the physiology of the human body; material based on the curriculum of the School of Medicine and taught from a systems viewpoint; concepts of cellular structure and function integrated into the tissue and organs, which are then related to the various systems of the body; interrelationships of the body systems, i.e., the interaction of the nervous system with the musculoskeletal system or the interaction of the respiratory system and its functions with the cardiovascular system. (Fall—evening) (Eisenberg)

Introduction to Medicine for Engineers II: Physiology and Anatomy (3)

Further elaboration of physiological systems, such as the endocine system, renal physiology, gastrointestinal physiology, and others; the separate systems of the body are integrated to present the functioning of the body as an overall system; considerable interaction with physicians and other medical personnel. Prerequisite: EE 283. (Spring—day) (Eisenberg)

Engineering in Physical Medicine and Rehabilitation (3)

Application of engineering theory and techniques to the rehabilitation of handicapped persons: major problem areas and general approaches, as well as specific solutions. Offered cooperatively with personnel from the Social and Rehabilitation Services Administration. Prerequisite: EE 284. (Spring, odd years—evening) (Eisenberg)

Sensory-evoked Potentials I (3)

Physiological significance of the sensory-evoked potential, stimulation variables, subject variables, data acquisition procedures and instrumentation, signal-averaging computers, analysis techniques for the VEP, applications of the VEP. Lectures, discussion, and laboratory. Prerequisite: EE 281, 282, 283, 284; or permission of instructor. (Fall—evening) (Eisenberg)

Computer-aided Analysis of Physiological Signals (3)

Computer analysis of physiological data obtained from the cardiovascular, pulmonary, and nervous systems. Sources and detection of various signals obtained from these systems; preprocessing of real signals; algorithmic techniques applicable to the analysis of these signals. Students are provided with real data and develop computer software for determining pertinent medical parameters as established by physicians. Prerequisites: EE 281, 282, 283, 284; and a working knowledge of FORTRAN. (Spring, odd years—evening) (Loew)

Physiological Controls and Systems (3)

Some applications of control and systems theory in the medical and biological fields. Application of general control and systems theory as applied to physiological systems. Specific applications of control and systems

theory to the visual system, respiratory system, cardiovascular system and musculoskeletal system. Prerequisite: EE 172 or equivalent; EE 280, 282, 283, 284. (Spring, even years—evening) (Eisenberg)

289 Clinical Engineering (3)

A cross-sectional view of clinical engineering applications, functions, variations, and patterns in the medical and allied health care area. Use of instrumentation, computers, and systems by clinical engineers in hospitals and clinics. The clinical engineer in cardiovascular measurement systems and intensive care units; other areas where functional usage of clinical engineering is applicable. Prerequisite: EE 281, 282, 283. (Fall, even years—evening) (Eisenberg)

298 Research (arr.)

Research as arranged. May be repeated for credit. (Fall and spring)

299–300 Thesis Research (3–3)

(Fall and spring)

319 Systems Science, Networks, and Controls Research (arr.)

Limited to students preparing for the Doctor of Science qualifying examination. May be repeated for credit. (Fall and spring)

323 Principles of Microelectronics (3)

Basic principles, techniques, and processes necessary for understanding microelectronics. Semiconductor physics, phase diagrams, crystal growth, epitaxy, vacuum techniques, thin-film deposition, diffusion, oxidation, junction formation, masking, and properties of thin films and materials. Prerequisite: EE 222 or equivalent. (Fall, odd years—evening) (Hegert)

329 Electrophysics Research (arr.)

Limited to students preparing for the Doctor of Science qualifying examination. May be repeated for credit. (Fall and spring)

345 Advanced Detection Theory (3)

Review of general estimation equations. Linear estimation: Weiner and Kalman-Bucy filters; nonlinear modulation theory; angle-modulation systems, analysis and design of phase-lock loops, optimum angle-modulation, rate distortion theory; Gaussian processes in Gaussian noise, detection and parameter estimation, canonical receivers, structures, and performance calculations for diversity systems, multiple pulse radars, stationary processes, and threshold receivers. Prerequisite: EE 245. (Spring—evening) (Pickholtz)

346 Communications Switching and Traffic Theory (3)

Switching network technology, step-by-step common control, stored program electronic switching systems. Traffic models. Engineering of multiple server systems, analysis of graded multiples and multistage connecting networks. Software issues, digital time division and store and forward switches. Analytical bounds on the complexity of switch networks, combined circuit and message switching. Current practice and practical issues. Prerequisite: EE 243 or permission of instructor. (Spring, even years—evening) (Pickholtz)

347 Data Communications (3) (Same as CSci 244)

Principles and practice of modern data communications. Modes for data transmission; terminals, modems, multiplexors, concentrators. Line con-

trol procedures. Protocols for buffer management, message reassembly, queue control. Distributed processing: terminal-oriented systems, data collection loops, multi-drop lines. Switched data systems; circuit and packet switching. Error control, cryptosecurity. Hardware and software interfacing. Prerequisities: EE 243 and CSci 201, 202, or permission of instructor. (Fall—evening) (Pickholtz)

349 Communications Research (arr.)

Limited to students preparing for the Doctor of Science qualifying examination. May be repeated for credit. (Fall and spring)

371 Simulation Methods for System Analysis (3)

Survey of simulation languages. Techniques of model building for material- and machine-based systems. Treatment of these systems with notion of transactions and states. Modeling the dynamic processes of growth problems. Analog, hybrid, and digital methods for simulation treated by means of case studies; speed and cost of alternate computing procedures. Project-type problems used to illustrate simulation methods. Prerequisite: CSci 278 or permission of instructor. (Fall, odd years—evening) (Bock)

372 Analysis and Control of Large Systems (3)

Systems as multistage decision processes. Analytical concepts of model-making and matrix representations of large systems. Approximation by models of lower dimension —reduction to simplified models; decentralized systems. Differential games; computation of saddle points; construction of an equilibrium point. Prerequisite: EE 273. (Spring, even years—evening) (Lee)

381 Bioelectric Phenomena (3)

Mathematical treatment of selected bioelectric phenomena. Membrane thermodynamics; membrane electrical potentials and subthreshold membrane effects; membrane dynamics. Solid-state phenomena in biology and medicine. Photoconduction. Mechanism of nerve propagation. Electrical models of the heart. Cell physiology. Quantum effects in biological systems. Prerequisite: EE 206, 281, 282, 283. (Fall, odd years—evening) (Eisenberg)

386 Sensory-evoked Potentials II (3)

A continuation of EE 286. Advanced lecture, discussion, and laboratory. Current topics in sensory-evoked potentials research; emphasis on clinical applications. Planning and conducting an advanced (clinical or research) project chosen to take maximum advantage of the student's technical background from an instrumentation, computer, and data analysis viewpoint. Prerequisite: EE 286 and permission of instructor. (Fall, odd years—evening) (Eisenberg)

389 Medical Engineering Research (arr.)

Limited to students preparing for the Doctor of Science qualifying examination. May be repeated for credit. (Fall and spring)

399 Dissertation Research (arr.)

Limited to Doctor of Science candidates. May be repeated for credit. (Fall and spring)

Computer Science Graduate Courses

201 Introduction to Computer Systems I (3)

Introduction to programming digital computers in assembly languages.

Architecture of traditional von Neumann and stack-based computers. Techniques in machine control and memory addressing. Number systems and codes. Techniques of structured programming. Use of a higher-level procedural language. Stacks and recursion. Prerequisite: CSci 51 or EE 51 or equivalent. (Fall and spring—evening) (Feldman)

202 Introduction to Computer Systems II (3)

Introduction to combinational and sequential logic networks; analysis and synthesis of switching circuits using Boolean algebra; minimization techniques in the design of logical circuits; number systems and arithmetic in digital computers, digital computer architecture and the design of functional sub-units; design of memory, arithmetic, and units comprising a digital computer; information flow, timing, and control in large digital computers. Prerequisite: CSci 201 or equivalent and permission of instructor. (Spring—evening) (Abd-Alla)

208 Computer Programming (3)

Use of a macroassembler in structured programming. Input/output programming at the assembly level. I/O buffer pools and their management. Program status and control, interrupt handling, reentrant subroutines. Linkers and loaders. Utilities. Introduction to operating systems and job control languages. Prerequisite: CSci 158 or EE 158 or CSci 201 or permission of instructor. (Spring—evening) (Maurer)

213 Discrete Structures in Computing (3)

Introduction to discrete mathematical structures used in computing. Sets, graphs, functions, mappings, lattices, groups, and semigroups. Combinatorial problems and enumerations. Finite-state machines, representation, identification, transitions, and reductions. Directed graphs, trees, and paths through a program. Regular expressions and relations between programs and computing machines. Prerequisite: CSci 51 and permission of instructor. (Fall and spring—evening) (Pickholtz)

214 Data Structures and Algorithms (3)

Computer data structures and their implementation as storage structures. Arrays, linked lists, and queues. Binary tree traversal, searching, threading and balancing. Storage management—allocation, de-allocation, and garbage collection. Search algorithms—linear, binary, and hashing. Sort algorithms. Analysis of algorithms. Structure and processing of sequential, index-sequential, and random files. Multi-list and inverted files. Prerequisites: EE 158 or CSci 158 or 201; 208 (may be taken concurrently) or 213; or permission of instructor. (Spring—evening) (Feldman)

216 Information Retrieval Systems (3)

Information organization and retrieval of natural language data by digital computer systems; statistical, syntactic, and logical analysis of natural language used for retrieval systems; dictionary systems including thesauri, look-up and phrase structures; searching strategies and cataloguing. Input preparation and output structures; large-scale file structures and operating systems required for their use. Prerequisite: CSci 214 and 227, or permission of instructor. (Spring—evening) (Foley)

219 Interactive Computer Graphics (3)

Architecture and implementation of display and interaction devices. Interactive graphics programming. Functional capabilities of graphics pack-

ages. Implementing a graphics package. 2D and 3D viewing, clipping, and transformations. Interaction techniques and human factors. Raster graphics scan-conversion algorithms. Hidden surface and hidden edge removal algorithms. Shading and texturing techniques. Prerequisite: CSci 214 or permission of instructor. (Fall—evening) (Foley)

220 **Pattern Recognition** (3)

Applications of pattern recognition, vector spaces, estimation and samples; Bayes estimation; density functions; stochastic approximation; decision rules in pattern recognition, minimal risk, Gaussian filters; bounds of risk, nearest-neighbor decision rules; clustering techniques, feature extraction. Sequential and nonparametric methods. Pattern recognition with *a priori* knowledge. Introduction to syntactic methods. Prerequisite: EE 204, CSci 214. (Fall—evening) (Loew)

222 **Design of User-Computer Dialogues** (3)

Design of dialogues for interactive terminal systems, including graphics systems. Psychological, physiological, linguistic, and perceptual factors. Advantages and disadvantages of various interactive techniques, command language syntaxes, and data presentations. Effect of operator training and motivation. Case studies, research readings, and projects. Prerequisite: CSci 214 or permission of instructor. (Spring—evening) (Foley)

223 **Simulation and Heuristics** (3)

Techniques of deterministic and probabilistic simulation on the digital computer. Mathematics for simulation; design of systems modules; random number generation and testing. Markovian and bounded context systems; generation of stochastic variates; Monte Carlo techniques; heuristics; verification techniques; simulation languages. Prerequisite: CSci or EE 158; or CSci 201; and permission of instructor. (Fall—evening) (Hoffman)

224 **Artificial Intelligence** (3)

Survey of topics. Analogies and simple concepts. Symbol manipulation and programming in LISP. Networks and simple learning. Scene analysis and sentence analysis. Programming the BLOCKS world. Depth-first and breadth-first searching, hill-climbing, network searching, min-max and alpha-beta pruning. Problem-solving systems. Prerequisite: CSci 214. (Spring—evening) (Hoffman)

227 **Management Information Systems and Data Base Management** (3)

Concepts in management information systems. Commercial programming features of COBOL and PL/I. Inverted files and query systems. Editing, report generation, updating, and updating load. Tradeoff between direct access and indexed-sequential access. Maintaining large programming systems which lead to the need for data base management systems; construction of data base management systems. Survey of some existing data base systems. Relational data base concepts and future developments. Students will create and update a data base and interface to application programs. Prerequisite: CSci 208, 214. (Fall—evening) (Hoffman)

229 **Security and Privacy in Computer Systems** (3)

Techniques for security of data and programs in computer systems. Authentication methods, logging, authorization, encryption, problems of statistical inference. Effects of operating systems and machine architecture on security. Cost trade-offs and risk analysis among various countermeasures. Theoretical models. Related nontechnical measures. Effect on

system design of legal constraints on data banks. Current and potent
legal constraints. Prerequisite: CSci 214 or equivalent. (Fall—evenin

232 Automata Theory (3)

Regular expressions including equality and transformations between s
quential machines and regular expressions. Turing machines, recurs
function, predicate calculus, and computability. Complexity of algorithm
Formal language theory including grammatical construction, recognizer
relationships between machines and grammars, and ambiguity. Rande
processes in sequential machines. Prerequisite: CSci 213. (Spring-
evening) (Friedman)

237 Computing Systems (3)

Organization of large digital computer systems. Design of high-speed arith
metic units. Random access and associative memories; rotational storag
devices; computer control and interrupt structures. Input-output channe
and interfacing problems. Communications in digital computers. Intro
duction to multiple-access and time-sharing systems. Prerequisite: CSci 2
EE 154; or CSci 202. (Fall—evening) (Abd-Alla)

239 Comparative Computer Systems (3)

Structures of computers and a general language for system descriptio
History of different computer structures. Development of the operatin
system. Special purpose processors. Multiprocessors and large compu
ing systems. Computer networks and time-shared systems. Comparison
of computer families. Characteristics and philosophies of computer desig
of the major manufacturers. Introduction to performance evaluation an
measurement. Effects of software and technology on computer structures
Prerequisite: CSci 237, 263. (Spring—evening) (Meltzer)

240 Theory and Practice of Microprogramming (3)

Basic concepts, techniques, and theory of microprogramming as applied
to the implementation of control systems for sequential machines. Micro
programming languages, assemblers, and hardware simulators, including
specific applications of these to the design of current computer systems
and their interfaces with real-time systems. Prerequisite: CSci 237, 263
(Spring—evening) (Merwin)

243 Fault Tolerant Systems and Design Automation (3)

Fault test generation for combination and sequential circuits, digital
simulation as a diagnostic tool, design of easily tested and fault tolerant
systems. Physical packaging of digital circuits; design of circuit boards
including partitioning, placement, and interconnection of elements. Pre
requisite: EE or CSci 153 or CSci 202. (Fall—evening) (Friedman)

244 Data Communications (3) (Same as EE 347)

Principles and practice of modern data communications. Modes for data
transmission; terminals, modems, multiplexors, concentrators. Line con
trol procedures. Protocols for buffer management, message reassembly,
queue control. Distributed processing; terminal-oriented systems, data
collection loops, multi-drop lines. Switched data systems: circuit and
packet switching. Error control, cryptosecurity. Hardware and software
interfacing. Prerequisite: EE 243; CSci 201, 202 or permission of instruc
tor. (Fall—evening) (Meltzer)

245 Advanced Computer Systems Theory I (3)

Analytical models applied to computing systems. Determinance, deadlocks, concurrency, and synchronization of computer processes. Optimal task scheduling using linear graph theory. Concurrent processes in multiprocessors. Analysis of the overlap of I/O and CPU processing. Queuing theory applied to time-shared computer models. Analysis of secondary storage devices and effective data rate. Analysis of memory buffer pools and multiprogrammed memory allocation. Memory allocation and storage heirarchy operation and their effect on throughput and response time. Prerequisite: EE 204; CSci 237, 263. (Fall—evening) (Abd-Alla)

246 Advanced Computer Systems Theory II (3)

Optimum secondary storage placement algorithms to improve throughput. Modeling of secondary storage operation and data staging. Analysis of memory allocation algorithms to improve system performance. Characteristics of computer system hardware and software to provide for multiprocessing, multiprogramming, and time-shared operation. Loosely and tightly-coupled multiprocessors. Analysis of front-end processors in data base operation and computer networks. System analysis of a large, time-shared, terminal-oriented transaction processing system. Prerequisite: CSci 245. (Spring—evening) (Abd-Alla)

255 Formal Languages, Correctness, and Structured Programming (3)

Introduction to formal computer languages. Structured programming and block-oriented languages. Regular, context-free, context-sensitive, and unrestricted computer grammars. Parsing a language, syntax of languages, pushdown automata and their use in compiling. Top-down structured programming. Avoidance of GO TO statements. Correctness, termination, and equivalence of programs. The inductive assertion method. Termination methods based on well-ordered sets. Assertion languages, program schemes, fixed point methods, and inductive principles. Prerequisite: CSci 214. (Fall—evening) (Maurer)

256 Design of Translators (3)

Design of procedure-oriented computer languages. Semantics and pragmatics as they affect the design of translators, interpreters, and compilers. Top-down and bottom-up recognizers. Production of machine code. Syntax-directed compiling. Tables and their organizations in translators. Optimizing compilers; compiler-compilers. Prerequisite: CSci 214. (Spring—evening) (Maurer)

258 Advanced Programming Languages (3)

Recent developments in programming language research. Modern data-structuring concepts such as abstract data structures, access control for reliability, and structuring of data in special-purpose languages. Language extensibility. Machine-independent design of language processors. Case studies will include Snobol 4, Pascal, and advanced concepts in PL/I. Students' projects will emphasize applications of these languages and concepts. Prerequisite: CSci 214 and permission of instructor. (Spring—evening) (Feldman)

263 Digital Computer Programming Systems (3)

Design of computer systems software. Design and programming of an assembler and loader. Multiprogrammed job control including linking, loading, linkage-edit, relocatability, region size, and status switching. Design of dispatchers and monitors. Design of utility programs. Input-output

programming and control. Communications among components of operating system. Prerequisite: CSci 208, 214. (Fall—evening) (M rer)

267 Operating Systems I (3)

Introduction to the operating system for batch-oriented multiprogramm computer systems. Software components which constitute the operat system. Facilities of the macro-assembler which utilize the operat system; loading and linking routines; initializing programs and tasks; d patching and the interrupt mechanisms. Memory management in fi and variable partitions; device and storage management. Input-outp control and use of access methods. Performance evaluation. Prerequisi CSci 263. (Fall—evening) (Foley)

268 Operating Systems II (3)

Introduction to operating systems for time-shared and multiproces computer systems. Processor management in a multiprocessor syste deadlocks, processor utilization, and I/O management. System ava ability and fail-soft mechanisms. Time-slicing and time-sharing operat systems and subsystems; transaction processing subsystems; memory ma agement in a paged and segmented virtual memory system. Performan of the operating system. Computer network software and an introducti to the computer as a utility. Introduction to security and large data ba management. Prerequisite: CSci 267. (Spring—evening) (Foley)

278 Analog and Hybrid Computers (3)

Analog computer components and electronics. Slow analog computer s lutions of linear and nonlinear differential equations. System simulatio and modeling on the analog computer. Introduction to the iterative ana log computer. Transfer function simulation and use in control the The hybrid computer, digital logic, and digital computer control. Digi to-analog and analog-to-digital converters and interfaces. Optimizat methods on a hybrid computer. Parameter variations and search m methods. Prerequisite or concurrent registration: CSci or EE 154; or CS 202; or permission of instructor. (Fall—evening) (Bock)

281 Applications of Numerical Methods I (3)

Basic numerical methods with emphasis on their application to enginee ing problems. Error sources and error control; numerical representati of functions; over-determined systems; eigenvalues and eigenvectors; in troduction to nonlinear equations; initial value and boundary value prob lems for ordinary differential equations. Theoretical concepts such a order of accuracy, Richardson's extrapolation, norm, stability, and co vergence. Some modern methods such as spline approximation and the QR algorithm for eigenvalues. (Fall—evening) (Meltzer)

282 Applications of Numerical Methods II (3)

A continuation of CSci 281. Systems of nonlinear equations; numerical optimization; numerical solution of common partial differential equation of engineering; methods for hyperbolic, parabolic, and elliptic problems; introduction to finite element methods. Prerequisite: CSci 281. (Spring—evening) (Meltzer)

285 Approximation of Functions and Data Representations (3)

Review of linear spaces; least squares, orthogonal functions; nonlinear techniques, gradient search methods; parameter estimation with discrete

data; Tchebysheff approximation; approximation and curve fitting by spline functions and Bernstein polynomials. Prerequisite: CSci 281. (Fall—evening at NASA Langley Research Center; spring, even years—evening, on campus) (Meltzer)

286 Numerical Methods in Engineering I (3)

Computational methods for solution of systems of linear algebraic equations and for the solution of the algebraic eigenvalue problem. Emphasis on accuracy and efficiency. Methods for banded and other sparse systems. Methods for parallel and pipeline processer computers. Prerequisite: CSci 281 and knowledge of linear algebra. (Spring—evening) (Meltzer)

287 Numerical Methods in Engineering II (3)

Computational methods for solution of systems of ordinary differential equations: single-step methods, general multistep methods; convergence and stability analysis, methods for stiff equations, step size control and control of order. Prerequisite: CSci 281 and knowledge of differential equations. (Spring—evening) (Meltzer)

288 Numerical Methods in Engineering III (3)

Computational methods for solution of boundary value problems in both ordinary and partial differential equations: shooting methods, finite difference methods, functional approximation methods, invariant imbedding, method of lines, treatment of boundaries in multidimensional problems. Prerequisite: CSci 282 and knowledge of differential equations. (Fall—evening) (Meltzer)

289 Numerical Methods in Engineering IV (3)

Computational methods for solution of initial value problems for partial differential equations: method of lines, consistency, stability, convergence; explicit and implicit finite difference methods, alternating direction methods, high-order methods. Prerequisite: CSci 282 and knowledge of partial differential equations. (Fall—evening) (Meltzer)

298 Research (arr.)

Research as arranged. May be repeated for credit. (Fall and spring)

299–300 Thesis Research (3–3)

(Fall and spring)

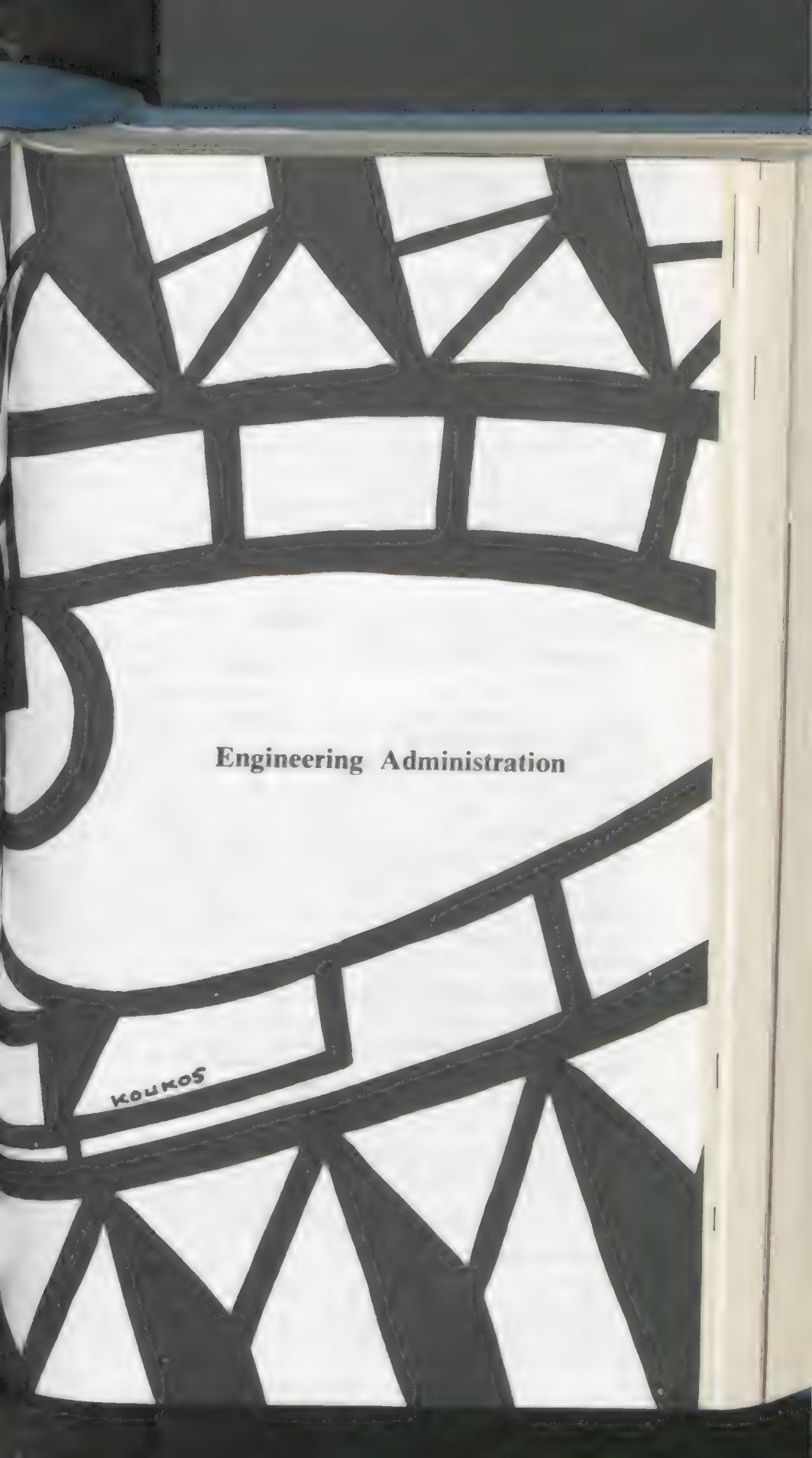
391 Computer Science Research (arr.)

Limited to students preparing for the Doctor of Science qualifying examination. May be repeated for credit. (Fall and spring)

399 Dissertation Research (arr.)

Limited to Doctor of Science candidates. May be repeated for credit. (Fall and spring)




Engineering Administration
KOUKOS

Engineering Administration

Professors P.A. Crafton, P.S. Shane, J. Kaye, M. Apstein *(Research)*, S. R
man *(Chairman)*, H.M. Steiner, S.B. Levin *(Research)*, J.V.R. Kautr
(Research)

Professorial Lecturers G.M. Coburn, J. Pachter, J.B. Du Peza, C.W. Fotis, L
Hearth, G.T. Malley, J.A. Belding, H.V. Nutt

Associate Professorial Lecturers R.L. Paullin, D.R. Levin, A. Hoshovsky, L
Blakey, R.F. Sears, G.M. Hollander, P. Rosenberg, J. Lisnyk

Assistant Professor B. Silverman

Assistant Professorial Lecturers R.J. Lynch, Jr., K. Lamar, J.R. Margul
S. Ficarro, T.L. Griswold, M. Novinsky, S.F. Pauls, F.E. Field, H. Kwa
Wu Hung, W.A. Goetz, S. Kimmel, R. Gurley, F. Shepard, F. Peterlin,
Hanley

Graduate Fields and Areas of Concentration

Administration of Research and Development
Construction Management
Engineering Administration
Environmental Management
Information Systems Management
Marketing of Technology
Systems Analysis and Management
Technology and Public Affairs
Transportation Management

Programs in Engineering Administration lead to the degrees of Master of En
neering Administration and Doctor of Science and to the Professional degr
Programs in Administration of Research and Development, Construction Ma
agement, Environmental Management, Information Systems Management, M
keting of Technology, Technology and Public Affairs, and Transportat
Management lead to the degree of Master of Engineering Administration. Pr
grams in Systems Analysis and Management lead to the degrees of Master
Science and Doctor of Science and to the Professional degrees. A student m
be accepted in a graduate program in order to receive credit for any gradu
courses taken to satisfy degree requirements.

THE MASTER OF ENGINEERING ADMINISTRATION DEGREE PROGRAM

The principal objective of the program leading to the degree of Master
Engineering Administration is to prepare students whose undergraduate educ
tion was in engineering, natural science, or mathematics for positions of m
agerial responsibility in technological and scientific organizations in indus
government, or the armed services.

The program is designed to help the student achieve a broad understanding
the administrative process. Although years of experience are required to deve
the skills, insight, and mature judgment which distinguish an effective manag
in technological and scientific organizations, a graduate professional manag
ment curriculum can give the student an effective start as a manager. The cu
riculum provides an opportunity to gain an understanding and to develop so
ful managerial skills in the functional areas of engineering administration. S
of the major purposes is to assist the student in forming the habit of examin
problems from an overall administrative point of view. The individual's ca

particular experience, and the explicit process of relating this experience to graduate study, provide each student with a personal frame of reference to interpret management in a rapidly changing world.

Successful education for engineering administration implies an understanding of what it is that an engineering manager must do, an analysis of the special functions involved in management, and a detailing of modern methods useful in making and executing decisions in the management of technological and scientific organizations. It is the aim of the School, therefore, to keep alive the spirit of general inquiry and a decision-making orientation.

The management of technological organizations is one of the most difficult challenges of our times. The professional engineering manager today must understand not only currently developing technologies but also the rapidly changing marketplace where these technologies are applied for society's benefit. The engineering administrator is the link between these dynamic technologies and the needs of society in general.

In summary, the program of study has for its objective an educational experience which will contribute to the development of managers possessing a combination of technical know-how and administrative skill.

Admission

In addition to the requirements for admission to graduate study (see page 27), applicants for programs leading to the degree of Master of Engineering Administration must meet the following requirements: (1) The applicant must have an adequate knowledge of the principles of human relations, the fundamentals of engineering economic analysis, and the fundamentals of quantitative methods. This requirement can be met by satisfactory completion of the following undergraduate courses or approved equivalents: EAd 150, *Introduction to Engineering Administration;* EAd 160, *Introduction to Engineering Economic Analysis;* and EAd 170, *Basic Quantitative Methods for Engineering Administration.* (2) The applicant may be required to complete other undergraduate prerequisite courses prescribed as a condition of admission. (3) A student is required to earn the grade of *C* or better (unless the requirement is stipulated to be a grade of *B* or better upon admission) in each undergraduate prerequisite course. If this scholarship requirement is not met, the student is barred from further enrollment. Credit for prerequisite courses is not applicable toward the degree of Master of Engineering Administration, and, unless approved by the department chairman, all prerequisite courses must be completed prior to taking graduate courses in this degree program.

Core Courses

The following courses are required for the Master of Engineering Administration degree and must be taken prior to any other course in the program:

EAd 211–12 Engineering Administration (3–3)

EAd 269 Elements of Decision-making and Problem-solving (3)

General Program

ENGINEERING ADMINISTRATION

Study in engineering administration provides the conceptual depth in management practice and knowledge needed by technical and scientific personnel who

are confronted with increasing demands and complexities. Technical knowled is complemented by an understanding of theory and practice in manageme action. Engineering management is a logical development of a technologi society. The program is designed to provide engineers with a knowledge a proficiency in the administration of engineering and science. It emphasizes t of deliberative, purposive study of general administrative problems and oppo tunities, as well as the study and use of specific knowledge and methods need to solve administrative problems and to explore opportunities. A program prescribed for each student in conference with the adviser.

Required Courses

EAd Core courses (9)

EAd 299–300 Thesis Research (6); or EAd 297 Problems in Engineering A ministration (3) (non-thesis)

Electives (18–21). Electives are chosen from the Department of Engineeri Administration and other departments of the University, but no more th two courses may be chosen from other departments.

Areas of Concentration

Students wishing to pursue a specific area of concentration, as opposed to fo lowing the general program in EAd, may select one of the following programs

ADMINISTRATION OF RESEARCH AND DEVELOPMENT

The program is designed to prepare students for responsible managerial posi tions in organizations conducting technological or scientific research and de velopment and in organizations planning and administering programs of tech nological or scientific research and development. A program is prescribed fo each student in conference with the adviser.

Required Courses

EAd Core courses (9)

EAd 207 The Personnel Function for Engineering Administration (3)

EAd 255 Administration of Research and Development (3)

EAd 299–300 Thesis Research (6); or EAd 297 Problems in Engineerin Administration (3) (non-thesis)

Electives (12–15)

CONSTRUCTION MANAGEMENT

Construction Management encompasses managerial functions in an organiza tion that plans and executes major construction work. This can take place in the field, in the project office, or in a main office. Due to the inherent complexity of present-day engineering, engineers need to know management as well as basic planning, design, and construction methods. They need to know construction developments, problems of contracts and specifications, techniques of scheduling and control, estimating, labor relations, and industrial or management psychology.

This program prepares the engineer for the task of marshalling men, mate rials, machines, and money as functions of time, cost, weather, and human

ture to plan and build structures. A program is prescribed for each student conference with the adviser.

Required Courses

Ad Core courses (9)
Ad 241 Construction Management I (3)
Ad 242 Construction Management II (3)
Ad 261 Economic Analysis in Engineering Planning (3)
d 299–300 Thesis Research (6); or EAd 297 Problems in Engineering Administration (3) (non-thesis)
ectives (9–12)

NVIRONMENTAL MANAGEMENT

his program prepares students for positions in organizations involved with environmental and related resource management. This includes organizations conting environmental control and in organizations planning and administering grams in the prevention and control of environmental pollution and reource utilization. A program is prescribed for each student in conference with adviser.

equired Courses

Ad Core courses (9)
Ad 221–22 Environmental Management (6)
Ad 261 Economic Analysis in Engineering Planning (3)
Ad 299–300 Thesis Research (6); or EAd 297 Problems in Engineering Administration (3) (non-thesis)
lectives (9–12)

NFORMATION SYSTEMS MANAGEMENT

Managers of technological and scientific organizations encounter a variety of nagement information systems required for day-to-day operations and long-nge decisions. This program helps to provide managers with the competence use such systems effectively. A program is prescribed for each student in nference with the adviser.

equired Courses

Ad Core courses (9)
Ad 254 Automatic Data Processing Systems (3)
Ad 251 Management of Computer Organizations (3)
Ad 295 Management of Technical Information (3)
Ad 321 Management Information Systems (3)
Ad 299–300 Thesis Research (6); or EAd 297 Problems in Engineering Administration (3) (non-thesis)
ectives (6–9)

ARKETING OF TECHNOLOGY

As the American economy matures and Americans survey the spectrum of options available to them, it is apparent that scientific and engineering outputs

must be sold in world-wide competition both at home and abroad. The train
specialist is becoming more important than ever before in performing the se
ing function.

The objective of this program is to prepare students for responsible positio
in marketing technical products and services. A program is prescribed for ea
student in conference with the adviser.

Required Courses

EAd Core courses (9)
EAd 293 Technical Enterprises (3)
EAd 294 Marketing of Technology I (3)
EAd 311 Marketing of Technology II (3)
EAd 299–300 Thesis Research (6); or EAd 297 Problems in Engineerin
Administration (3) (non-thesis)
Electives (9–12)

TECHNOLOGY AND PUBLIC AFFAIRS

This program prepares students for responsible positions requiring manageri
decision-making on matters that involve the impact of technology on pub
policy and that concern the general interrelationship between modern technolo
and public affairs. A program is prescribed for each student in conference wi
the adviser.

Required Courses

EAd Core courses (9)
EAd 261 Economic Analysis in Engineering Planning (3)
EAd 386 Advanced Topics in Management (3)
EAd 299–300 Thesis Research (6); or EAd 297 Problems in Engineerin
Administration (3) (non-thesis)
Electives (12–15)

TRANSPORTATION MANAGEMENT

The Transportation Management program prepares students for responsibl
positions in the management of transportation systems or the formulation
transportation policy. A program is prescribed for each student in conferenc
with the adviser.

Required Courses

EAd Core courses (9)
EAd 265 Transportation Management I (3)
EAd 266 Transportation Management II (3)
EAd 261 Economic Analysis in Engineering Planning (3)
EAd 299–300 Thesis Research (6); or EAd 297 Problems in Engineering
Administration (3) (non-thesis)
Electives (9–12)

THE MASTER OF SCIENCE DEGREE PROGRAM

Systems Analysis and Management

This program leads to the degree of Master of Science and is administered by the Department of Engineering Administration. Students are prepared for responsible positions in the practice of systems analysis.

The student should achieve a broad understanding of the administrative and decision-making process and of the systems approach to managerial problem solving, and be competent in applying mathematical and statistical techniques to the solution of managerial problems.

The graduate should be able to develop insight into the variety and nature of managerial problems, their causes, and possible cures. In addition, the graduate should understand the importance of the human factor in administration and be able to apply scientifically based analysis and quantitative methods in dealing with managerial problems. The systems viewpoint will help in learning to arrange and relate information about the organizational unit in which a problem exists. Whether the student aspires to be a manager or to be a staff person dealing with managerial matters, the student should acquire concepts and experiences helpful in preparing for such a position.

ADMISSION

Admission requirements for the Master of Science degree in Systems Analysis include a bachelor's degree in engineering, natural sciences, or mathematics from a recognized institution. Applicants to graduate study must, in addition, meet the following requirements: (1) the applicant must have an adequate knowledge of the principles of human relations, the fundamentals of engineering economic analysis, and the fundamentals of quantitative methods. This requirement can be met by satisfactory completion of the following undergraduate courses or approved equivalents: EAd 150, *Introduction to Engineering Administration*; EAd 160, *Introduction to Engineering Economic Analysis*, and EAd 170, *Basic Quantitative Methods for Engineering Administration*. (2) The applicant may be required to complete other undergraduate prerequisite courses prescribed as a condition of admission. (3) The student is required to earn the grade of *C* or better (unless upon admission the requirement is stipulated to be a grade of *B* or better) in each undergraduate prerequisite course. If this scholarship requirement is not met, the student is barred from further enrollment. A student is not permitted to repeat any of the undergraduate prerequisite courses. Credit for prerequisite courses is not applicable toward the degree of Master of Science in System Analysis, and, unless approved by the Department Chairman, all prerequisite courses must be completed prior to taking graduate courses in this degree program.

*PREREQUISITES (or equivalents)

EAd 150 Introduction to Engineering Administration (3)
EAd 160 Introduction to Engineering Economic Analysis (3)
EAd 170 Basic Quantitative Methods for Engineering Administration (3)
CSci 51 Applications of Computers (3)

*Students may not receive graduate credit for these courses.

REQUIRED COURSES

EAd 211–212 Engineering Administration (3–3)
EAd 269 Elements of Decision-Making and Problem-Solving (3)
EAd 281–282 Systems Analysis and Management (3–3)
EAd 283 Systems Engineering
EAd 287 Systems Modeling and Simulation
EE 202 Linear System Theory I (3)

For Thesis Option
EAd 299–300 Thesis Research (3–3)

For Nonthesis Option (all students must take EAd 297 plus any two of the other four courses listed below)
OR 201 Survey of Operations Research Methods I (3)
OR 202 Survey of Operations Research Methods II (3)
OR 273 Digital Systems Simulation (3)
EE 203 Linear Systems Theory II (3)
EAd 297 Problems in Engineering Administration (3)

THE PROFESSIONAL DEGREE PROGRAM

The Department of Engineering Administration has established the Professional degree program for those students who are interested in pursuing course work beyond the Master's degree, with emphasis on applied subject material rather than research. The program leads to the degree of Applied Scientist or to the degree of Engineer and has been designed to meet the needs of industry and government for highly prepared personnel in engineering administration.

In the Professional degree program, emphasis is on increasing the student's knowledge, understanding, and skill by concentrating on principles and their application. This approach provides the individual with flexibility to adapt successfully to changing circumstances.

Each student's program is planned considering background and needs, subject to departmental requirements.

Professional Degree Study Programs

The Professional degree program provides post-Master's degree graduate study in areas in which the Department has adequate facilities and resources. Upon departmental approval, the student may select courses in other University departments to meet specific needs or objectives. Courses can, upon departmental approval, be chosen in the following areas:

Administration of Research and Development
Construction Management
Engineering Administration
Environmental Management
Information Systems Management
Marketing of Technology
Systems Analysis and Management
Technology and Public Affairs
Transportation Management

A student's program of study will provide concentration in a selected area, and include courses from other areas. A program consists of a minimum of 30 semester credit hours of approved graduate courses beyond a Master's degree, six of which are devoted to a professional project. Students whose prior study does not include specified prerequisites may be required to take more than the minimum number of credit hours.

ADMISSION

Admission to graduate study toward the Professional degree requires appropriate bachelor's and Master's degrees from recognized institutions, and evidence of capacity for productive study. To study toward the Professional degree of Engineer (in Engineering Administration), an applicant must possess a bachelor's degree in engineering; for the Professional degree of Applied Scientist (in Engineering Administration), an applicant must possess a bachelor's degree in mathematics or a natural science. In both cases a Master's degree in engineering administration or a related field is required. Applicants having equivalent backgrounds of study may be considered. At least a 3.00 average in graduate study is required.

Those applicants having Master's degrees in engineering, natural science, or mathematics may be required to meet the following prerequisites: at least the three core courses (EAd 211–12, 269) with a grade of *B* or better.

Those applicants wishing to pursue Systems Analysis must possess a Master's degree in systems analysis or a related field. Applicants having Master's degrees in engineering, natural science, or mathematics may be required to complete EAd 211–12, 269, 281, and/or 282 with a grade of *B* or better.

ADMISSION TO CANDIDACY

An applicant is admitted to candidacy for the degree after satisfactorily meeting any prerequisite requirements and conditions. No courses taken by the applicant to meet these prerequisite requirements and conditions can be applied toward the Professional degree. If course work beyond the prerequisites and conditions is taken in the interval between admission to study and admission to degree candidacy, a maximum of only nine hours of this additional course work can, with the approval of the adviser, be applied toward meeting degree requirements.

TRANSFER CREDIT

Up to six semester credit hours of satisfactory study (with grades of *A* or *B*) in a graduate program beyond a Master's degree will be considered for transfer toward the Professional degree. They must have been earned within five years of admission to candidacy for the Professional degree, and must be appropriate to satisfy requirements for the Professional degree. The student must, with the approval of the adviser, petition the Department Chairman for such transfer.

PROGRAM OF STUDY

Upon admission the student is assigned a faculty adviser. A program of study is drawn up considering any deficiencies at admission, preparation for the Com-

prehensive Examination, and Professional degree requirements. The program of study for each student must be approved by the student's adviser and the Department Chairman. An area of concentration is selected to prepare the student to undertake the professional project. Other courses are selected either to support work on the planned projects or to meet other needs. With prior approval of the adviser, up to nine credit hours of study may be taken in other departments of instruction in the University if such work is pertinent to the program. These nine hours include the six potential transfer credits.

PROFESSIONAL PROJECT

Each degree candidate must engage in a professional project on which the candidate will submit an acceptable report of an analysis and solution of a "real world" problem in engineering administration. The student is to demonstrate ability to apply newly acquired knowledge to identify a problem, determine a significant problem, work toward a solution, and communicate the results in writing.

When the course work is essentially completed, the candidate, with the adviser's approval, will register for EAd 395 96 *Seminar: Professional Project* (3–3) to receive guidance in the professional project. Before registration the candidate should have identified an area or project to study, and prepared a study proposal, including consideration of the feasibility of the proposed effort. Shortly after registration for work on the project, the candidate must submit a detailed project proposal to the Department Chairman, with approval of the project adviser. Six semester credit hours are assigned for work on the project.

SCHOLARSHIP

No student studying for the Professional degree may receive more than two course grades below *B* or more than one *F*. If the student does receive more than two course grades below *B*, or more than one *F*, study is terminated and further enrollment is prohibited. A student must achieve a final quality-point average of at least 3.00 to receive the degree.

TIME TO COMPLETE PROFESSIONAL DEGREE REQUIREMENTS

A full-time student in the Professional degree program is allowed a maximum of three calendar years to complete all degree requirements, from the date of the student's first registration as a graduate student in prerequisite or graduate courses. A part-time student in this program is allowed a maximum of five calendar years. The time limit does not include any period of registration as an unclassified student before admission to graduate status, nor does it encompass any specified period spent on approved leave of absence under the conditions and requirements then prevailing.

Students who do not complete degree requirements within the allowed time will have their graduate status terminated. They may be readmitted to graduate status under conditions specified by the Department Chairman.

RESIDENCE AND CONTINUOUS STUDY

All work for the degree must be done in residence (on the campus) except when special permission is granted by the Chairman of the Department. The student must maintain continuous enrollment in the School. Failure to do so breaks the student's registration and necessitates application for readmission to the Professional degree program under whatever conditions and regulations are in effect at that time.

DOCTORAL STUDY

Programs in Engineering Administration and in Systems Analysis and Management leading to the degree of Doctor of Science provide advanced study and research to enable gifted students to extend their knowledge and to enhance their career opportunities in research or education.

Admission to Doctoral Study

All applicants must meet the general requirements for admission to doctoral study stated on page 35.

Applicants for doctoral study in Engineering Administration must have a Master's degree, with a superior record of academic achievement in Engineering Administration or a related field. Those applicants having Master's degrees in engineering, natural science, or mathematics may be required to meet the following prerequisites: at least the three core courses (EAd 211–12, 269) with a grade of *B* or better.

Those applicants wishing to pursue Systems Analysis and Management must possess a Master's degree in systems analysis or a related field. Applicants having Master's degrees in engineering, natural science, or mathematics may be required to complete EAd 211–12, 269, 281, and/or 282 with a grade of *B* or better.

An applicant is admitted to candidacy for the degree after he has completed all course and language requirements, and qualifying examinations.

Admission to Candidacy

An applicant is admitted to candidacy for the degree after satisfactorily meeting any prerequisite requirements and conditions and after completing *all* course and language requirements, and qualifying examinations. (See p. 35–38.) No courses taken by the student to meet prerequisite requirements and conditions can be applied toward the Doctoral degree. If course work beyond the prerequisites and conditions is taken in the interval between admission to study and admission to the degree program, a maximum of only nine hours of this additional course work can, with the approval of the adviser, be applied toward meeting degree requirements.

Transfer Credit

Up to six semester credit hours of satisfactory study (with grades of *A* or *B*) in a graduate degree program beyond a Master's degree will be considered for transfer toward the Doctoral degree. They must have been earned within the five years preceding admission for the Doctoral degree, and must be appro-

priate to satisfy requirements for the Doctoral degree. The student must, with the approval of the adviser, petition the department chairman for such transfer.

Programs of Study

Major fields leading to the degree of Doctor of Science are available in Engineering Administration and in Systems Analysis and Management. In addition to the major field, one or two minor areas of concentration are normally required, which may be chosen from the areas administered by this Department and/or from appropriate areas available in other departments of the University. The general requirements for doctoral study are stated on pages 34–38.

Upon admission, the student is assigned a faculty adviser. A program of study is drawn up considering any deficiencies at admission, preparation for the Qualifying Examination, and Doctoral degree requirements. The program of study for each student must be approved by the student's adviser and the Department Chairman. An area of study is selected to prepare the student to undertake the dissertation research. Other courses are selected either to support work on the dissertation or to meet other needs.

Dissertation

Each degree candidate is required to prepare and submit a dissertation according to the requirements described on page 37. Once the Qualifying Examinations are satisfactorily completed, the candidate with the adviser's approval will register for EAd 399, *Dissertation Research*. Before registration the candidate should have identified an area or project to study, and have prepared a research proposal, including consideration of the feasibility of the proposed effort. Shortly after registration for work on the research, the candidate must submit a detailed project proposal to the Department Chairman, with approval of the Director of Research.

Scholarship

No student studying for the Doctoral degree may receive more than two course grades below *B* or more than one *F*. If the student does receive more than two course grades below *B* or more than one *F*, study is terminated and further enrollment is prohibited. A student must achieve a final quality-point average of at least 3.2 to receive the degree.

Time to Complete Doctoral Degree Requirements

A full-time student in the Doctoral degree program is allowed a maximum of five calendar years to complete all degree requirements, from the date of the student's first registration as a graduate student in prerequisite or graduate courses. A part-time student in this program is allowed a maximum of seven calendar years. The time limit does not include any period of registration as an unclassified student before admission to graduate status, nor does it encompass any specified period spent on approved leave of absence under the conditions and requirements then prevailing. (See page 38.)

Students who do not complete degree requirements within the allowed time will have their graduate status terminated. They may be readmitted to graduate status under conditions specified by the Department Chairman.

Residence and Continuous Study

All work for the degree must be done in residence (on the campus) except when special permission is granted by the Chairman of the Department. The student must maintain continuous enrollment in the School. Failure to do so breaks the student's registration and necessitates application for readmission to the Doctoral degree program under whatever conditions and regulations are in effect at that time.

ENGINEERING ADMINISTRATION UNDERGRADUATE COURSES

150 **Introduction to Engineering Administration** (3)

The interrelationships of engineering, science, and management; conceptual foundations for interaction of human factors in individuals, groups, and the social environment of engineering activities. Familiarization with typical activities of engineering managers and with factors bearing on the motivation of engineers and on engineers as managers. Social and organizational factors relevant to the management of engineers. This course is preliminary to the complete management process studied in EAd 211–12. (Fall, spring, summer)

160 **Introduction to Engineering Economic Analysis** (3)

Economic decisions, equivalence, mathematics of finance, present worth, annual cost or profit, internal rate of return, benefit/cost ratio, incremental analysis, multiple alternatives, economic decisions under risk, inflation, depreciation methods, balance sheets, profit and loss statements, the accountant's view, and before- and after-tax analysis. (Fall, spring, summer)

170 **Basic Quantitative Methods for Engineering Administration** (3)

An introductory treatment of quantitative tools and techniques important in engineering administration. Concepts of probability statistics, and operations research. (Fall, spring, summer)

ENGINEERING ADMINISTRATION GRADUATE COURSES

204 **Administration of Engineering Contracts** (3)

Study of the total contracting process, including initial budget preparation and justification, actions leading to the execution of a contract, and administration of the contract to completion; considered from the viewpoints of the industrial and government buyer and the seller of technical materials and services. (Fall and spring)

207 **The Personnel Function for Engineering Administrators** (3)

Principles of managing human talent, the most vital resource in engineering or research; emphasis on principles, theory, and practical considerations of the personnel function for engineering managers, with practical applications in an engineering administration environment. (Fall and spring)

210 **Engineering Law** (3)

Legal principles and procedures of interest to engineers. The American legal system, contracts and specifications, liability of professional engi-

neers, product liability, agency relationships, patent and proprietary rights, special problems in research and developmental contracts. (Fall and spring)

211–12 Engineering Administration (3–3)

Comprehensive and systematic study of the administrative process; industrial, scientific, and engineering environments. Planning: objectives, prediction, policies, and characteristics of plans. Organizing: theory of organization, structure, authority, specialization, delegation, staff, and committees. Directing: leadership, managing human and material resources. Controlling: setting standards, evaluating performance, using system feedback data for correction and improvement. Prerequisite: EAd 150, and 160, or equivalent. (Fall, spring, summer)

221–22 Environmental Management (3–3)

The spectrum of technical, economic, political, administrative, and social forces influencing the quality of our environment and the utilization of our resources. Review of governmental and industrial programs to combat pollution of the air, land, and water. Historical development of legislation dealing with environmental science and resource management. Review of pending legislation involving environmental and energy matters; theoretical aspects of specific management problems; review of tools for decision-making. (Academic year)

231 Program Management (3)

Programs and projects are widely used in industry and government to facilitate the management of technical undertakings. Management science, the systems approach, and traditional managerial concepts are applied to a variety of typical cases. (Spring)

241 Construction Management I (3)

Contract negotiations; aspects of contracts and specifications important to management. Construction estimating and cost allocation in heavy and building construction; budgeting and accounting concepts. (Fall)

242 Construction Management II (3)

Construction administration: organization, construction planning, and scheduling. Industrial relations and human factors in construction management, work measurement, programming and progressing, project management and control. (Spring)

243 Construction Management III (3)

Managerial problems associated with advanced methods of construction and equipment; trend of mechanization; equipment policy and depreciation. (Fall)

251 Management of Computer Organizations (3)

Planning, organizing, and control of computer operations. Management of a computer organization as an independent service bureau or as an integral part of a larger organization. Supervision of professional and subprofessional computer personnel. Prerequisite: EAd 254. (Fall)

253 Production Management (3)

Planning, organizing, and control of production; forecasting techniques, material management; methods of loading and scheduling production processes; electronic methods in production control. Organization and admin-

istration of the plant engineering function with emphasis on maintenance control programs. (Spring)

254 **Automatic Data Processing Systems** (3)

Logic of computers, hardware and software, systems analysis for data processing applications, systems design, systems economics. Impact on decision-making, business, and society. (Spring)

255 **Administration of Research and Development** (3)

The study of technological innovation as a vital part of the acquisition process; the role of the technical administrator in utilizing organization, plans, and control to accomplish research and development objectives. (Fall and spring)

261 **Economic Analysis in Engineering Planning** (3)

Case studies in engineering economic planning, advanced problems in engineering economy. Prerequisite: EAd 160 or an equivalent course in engineering economy, and permission of instructor. (Fall and Spring)

262 **Finance for Engineers** (3)

Exposition of the financial concepts encountered in engineering situations; financial statements, costing, inventories, profitability analysis, depreciation, credit, leasing, and capital formation. (Fall)

265 **Transportation Management I** (3)

Integration of social, technical, economic, and political considerations which shape transportation systems and their management. Course material focuses on industry and local, state, and federal government programs in transportation. A management study of a local, regional, or national system will be required. (Fall)

266 **Transportation Management II** (3)

Legal aspects of transportation systems and their management. (Spring)

269 **Elements of Decision-Making and Problem-Solving** (3)

Concepts and quantitative techniques of scientific method in solving administrative problems. Role of decision criteria and subjective factors. Managerial economics. Model building, testing, solving. Replacement under certainty or risk. Control-general, control charts, sampling inspection. Experimentation to differentiate variables, build models-canons of induction, statistical tests, analysis of variance, linear regression. Application to nonmathematical formulations. (Fall, spring, and summer)

281 **Systems Analysis and Management I** (3)

The systems or holistic approach as a methodology for making decisions and allocating resources. Analysis by means of objectives, alternatives, models, criteria, and feedback. (Fall)

282 **Systems Analysis and Management II** (3)

Extension and elaboration of systems analysis techniques, including their application to industry, input-output structures, human behavior in organizations, and military situations. Prerequisite: EAd 281. (Spring)

283 **Systems Engineering** (3)

Concept of system structure and organization. Linear and nonlinear systems analysis; dynamics and stability of systems. Introduction to optimization methods and systems simulation techniques. (Fall, odd years

285 **Seminar: Administrative Problems** (3)

Individual analysis of complex administrative problems, with group evaluation and discussion. Prerequisite: 18 semester hours of graduate credit (Fall and spring)

287 **Systems Modeling and Simulation** (3)

Introduction to systems modeling and simulation dealing primarily with industrial, organizational, and control models. Emphasis on analyzing the system performance and designing an improved system using analytical or simulation techniques. Prerequisite: EAd 281, 283 or equivalent and permission of instructor. (Fall, even years)

288 **Technology Issue Analysis—The Engineering Approach** (3)

A seminar for technical managers who need the contextual background and intellectual basis for addressing technology issues in the public and private sectors. Technology impact analysis, technology forecasting, and the principles and practices of technology transfer are treated as elements of a systematic approach to informed choice and sound technology decisions. (Fall, odd years)

291 **Structured Analysis of Management Problems** (3)

Application of each phase of a structured problem-solving approach to small-scale management problems. Students will determine problem symptoms; define problems; select a problem; determine constraints on solutions and alternative feasible solutions; develop the solutions, select one, test the solution, plan controls on it, and plan its implementation. Prerequisite: EAd 269. (Spring, even years)

293 **Technical Enterprises** (3)

Essential features of technology-based companies from the entrepreneur's point of view. Team management of an enterprise in a computer-simulated environment. For those within technical firms and those within government who depend on technical firms as suppliers. (Fall)

294 **Marketing of Technology I** (3)

Marketing industrial goods and high-technology projects; special attention to the federal government as a market. Products, channels, pricing, promotion, and personal selling as elements of strategy. (Spring)

295 **Management of Technical Information** (3)

Needs and objectives of technical information systems, functions involved in technical information, storage and retrieval, abstracting, computer usage in technical information systems, system organization. Prerequisite: EAd 251. (Spring)

297 **Problems in Engineering Administration** (3)

Project course providing the student with the opportunity to apply the various concepts and tools previously studied to the solution of a problem in engineering administration. Students work individually or in small groups, each on a problem proposed by the student and approved by the

instructor. Open to Master's degree students only. Departmental. (Fall, spring, summer)

298 **Research** (arr.)

Basic or applied research in engineering administration or systems analysis. May be repeated for credit. Open to Master's degree students only. Departmental. (Fall, spring, summer)

299–300 **Thesis Research** (3–3)

(Fall and spring)

311 **Marketing of Technology II** (3)

Continuation of EAd 294. Special attention to marketing research, negotiation, and international marketing. Required for Master's degree candidates in the Marketing of Technology program. Prerequisite: EAd 294. (Fall, even years)

321 **Management Information Systems** (3)

Study of the development and management of information systems used by middle and higher management of technological and scientific organizations, in the control of many facets of the organization at all managerial levels. Required for Master's degree candidates in the Information Systems Management program. Prerequisite: EAd 295. (Spring, even years)

386 **Advanced Topics in Management** (3)

Reading and discussion of classic and important recent literature concerning the philosophy and application of management principles. (Fall, odd years)

387 **Technological Forecasting** (3)

Concepts and methodology: normative and exploratory forecasting, resource allocation and forecasting, technology transfer, technological change and its effects on forecasting, technology assessment. (Spring, even years)

388 **Cost Effectiveness** (3)

Concepts of evaluation of engineered systems, current methods and trends in methodology, system resource requirements, probability and decision theory in cost effectiveness studies, systems approach to cost effectiveness studies. (Spring, odd years)

394 **Advanced Study** (arr.)

Limited to Departmental Professional degree students. May be repeated for credit. (As arranged)

395–96 **Seminar: Professional Project** (3–3)

Limited to Departmental Professional degree candidates. (As arranged)

398 **Advanced Reading and Research** (arr.)

Limited to students preparing for the Doctor of Science qualifying examination. May be repeated for credit. (Fall and spring)

399 **Dissertation Research** (arr.)

Limited to Doctor of Science candidates. May be repeated for credit. (Fall and spring)




Operations
Research

Operations Research

Professors W.H. Marlow, D. Gross *(Chairman)*, N.D. Singpurwalla, A.V. Fiacco, G.P. McCormick, J.E. Falk, R.M. Soland *(Research)*, N.R. Mann *(Research)*

Professorial Lecturers F. Frishman, S.C. Tignor, J.D. Waller, D.B. Webster, H. Weingarten, W.R. Nunn

Associate Professorial Lecturers A.L. Haines, J.W. Blankenship, S.J. Balut, J.L. Horowitz, G.R. McNichols, L.J. Riccio

Assistant Professor Z. Barzily

Assistant Professorial Lecturers H.S. Balaban, K.R. Hoffman, J.F. Ince, H.D Kahn, B.D. Nussbaum

---

Programs in operations research lead to the degrees of Bachelor of Science, Master of Science, Doctor of Science, and to the Professional degree of Applied Scientist.

OPERATIONS RESEARCH AND COMPUTATIONAL SCIENCE PROGRAM—UNDERGRADUATE STUDY

Operations research and computational science can be described as the use of scientific methods in decision-making. It seeks to observe, understand, and predict the behavior of purposeful man-machine systems by taking a quantitative approach to management.

In today's complex world well-trained managers and decision makers are increasingly needed to apply mathematical concepts, scientific techniques, and management tools (e.g., computers) to solving a wide variety of multi-faceted technical problems. These managers must be able not only to understand such problems, but they must also devise and implement solutions. This requires individuals who have a basic understanding of mathematics, the sciences, and engineering, combined with the analytical skills required to comprehend and plan a method of approaching and solving complex problems.

Techniques of operations research and computational science are designed to cope with problems of practical significance, which are often characterized by complicated and uncertain environments. These techniques have contributed to the solution of problems of choice, policy, and planning which have arisen in military, governmental, industrial, environmental, and social contexts.

The significant features of operations research and computational science—a broad range of potential applications and a wide variety of scientific techniques which can be selected and combined for a multidisciplinary approach—work together to make the profession a dynamic and exciting one. Operations research and computational science should be particularly considered by those who are attracted to the use of mathematics, statistics, engineering, and science in solving decision-making problems of practical significance.

(1) Core Curriculum: First Four Semesters

The first four semesters of work concentrate on the fundamentals of science and mathematics, and also include study in English, the humanities, and the social sciences.

First Semester

CSci 51:	**Applications of Computers (3)**
Engl 9 or 10:	English Composition: Language as Communication (3)
Math 30–31:	Precalculus and Single-Variable Calculus I (3)*
or	
Math 31:	**Single-Variable Calculus I (3)**
Phys 3:	**Foundations of Physics (3)**
Elective:	Selected from humanities or social sciences (3)

Second Semester

EngS 4:	Descriptive Geometry and Drafting (3)
Math 32:	**Single-Variable Calculus II (3)**
Math 33:	**Multivariate Calculus (3)**
Phys 14:	Introduction to Mechanics and Thermal Physics (3)
Elective:	Selected from humanities or social sciences (3)

Third Semester

ApSc 57:	**Analytical Mechanics I (3)**
ApSc 113:	**Engineering Analysis I (3)**
ApSc 115:	**Engineering Analysis III (3)**
Chem 13:	**General Chemistry (3)**
Phys 15:	**Elements of Electricity and Magnetism (3)**
Elective:	Selected from humanities or social sciences (3)

Fourth Semester

CSci 52:	Computers and Societal Problems (3)
ApSc 58:	Analytical Mechanics II (3)
ApSc 114:	Engineering Analysis II (3)
ApSc 116:	Engineering Analysis IV (3)
Phys 16:	**Introduction to Modern Physics (3)**
Elective:	Selected from humanities or social sciences (3)

(2) Core Curriculum: Last Four Semesters

During the last four semesters the student concentrates on the professional courses in operations research, computer science, engineering administration, mathematics, and statistics. In addition, one technical elective each semester must be chosen and the student may choose *sets* of electives which offer concentration in areas such as engineering, mathematics, statistics, or environmental science.

Fifth Semester

OR 101:	Survey of Operations Research Methods I* (3)
CSci 157:	Machine and Assembly Language Programming (3)
EAd 150:	Introduction to Engineering Administration (3)
Math 124:	**Introduction to Matrix Theory (3)**

* Transfer students who have not successfully completed a college-level calculus course with a grade of C or better from an accredited institution, or high school students who did not take an advanced placement (AP) calculus course and receive a score of 4 or 5 on the AP test, will be required to take a one-hour locally administered math placement test at registration. This test covers algebra, trigonometry, and graphs. Students who do not place directly into Math 31 as a result of this test will be required to undertake a combined precalculus and calculus course (Math 30–31) during their first semester; this combined course meets five hours per week and carries three semester hours of credit if the student successfully completes the second half (Math 31) of the combined course.

Elective: *One* technical elective selected from:
- EE 11: Linear Networks I (3)
- ME 131: Thermodynamics (3)
- CSci 155: Introduction to Numerical Methods for Computers (3)
- Math 153: Introduction to Numerical Analysis (3)

Elective: Selected from humanities or social sciences (3)

Sixth Semester

OR 102: Survey of Operations Research Methods II* (3)
CSci 152: Introduction to Digital Computers (3)
EAd 160: Introduction to Engineering Economic Analysis (3)
Stat 187: Theory of Sampling (3)
Elective: *One* technical elective selected from:
- EE 12: Linear Networks II (3)
- ME 126: Fluid Mechanics (3)
- Math 113: Graph Theory (3)
- Math 157: Introduction to Complex Variable Theory (3)

Elective: Selected from humanities or social sciences (3)

Seventh Semester

OR 151: Linear Programming* (3)
CSci 158: Algorithmic Methods and High-level Language (3)
Stat 118: Regression Analysis (3)
Math 139: Advanced Calculus I (3)
Elective: *One* technical elective selected from:
- EE 20: Introductory Engineering Electronics (3)
- EE 31: Fields and Waves I (3)
- ME 176: Environmental Engineering Problems (3)
- ME 191: Mechanical Design (3)
- CE 193: Hydraulics (3)
- Stat 188: Nonparametric Statistical Inference (3)
- Math 121: Introduction to Abstract Algebra I (3)

Eighth Semester

OR 191: Problems in Operations Research* (3)
CSci 159: Programming and Data Structures (3)
Stat 117: Analysis of Variance (3)
Math 140: Advanced Calculus II (3)
Elective: *One* technical elective selected from:
- EE 32: Fields and Waves II (3)
- EE 121: Engineering Electronics and Design (3)
- EE 172: Control Systems Design (3)
- EE 177: Electrical Energy Conversion (3)
- ME 148: Thermodynamic Analysis (3)
- ME 193: Engineering Systems Design (3)
- CE 110: Introduction to Environmental Engineering (3)
- CE 194: Environmental Engineering I: Water Supply and Resources (3)
- Math 154: Difference Equations (3)
- Stat 159: Principles of Bayesian Statistics (3)
- Math 122: Introduction to Abstract Algebra II (3)

* Undergraduates will register for the 100-level courses but will attend lectures for the corresponding 200-level courses; separate requirements and grading standards will be employed.

(3) Postgraduate Work

Upon completion of the four-year degree program, the student may, if he/she wishes, study one more year and obtain a Master of Science degree in Operations Research. Graduates of the Operations Research and Computational Science curriculum are given 2 credits of advanced standing which are applicable to the master's program.

MASTER'S STUDY

The objective of the Master's program in operations research is to prepare students with appropriate undergraduate backgrounds for in-depth study of analytically oriented techniques of management decision-making and their applications.

Expanded scientific, statistical, and mathematical knowledge, combined with growing needs, in technological as well as social areas, has created increased demand for individuals trained in operations research. The discipline of operations research uses scientific principles supported by statistical and mathematical methodology to study the function and structure of complex industrial, military, and social systems in an effort to evaluate the probable effects of proposed courses of action, to establish criteria to judge the effectiveness of these courses, and to assist in the making of optimal decisions. The program in operations research provides a scientific basis for solving problems involving the interaction of many factors and organizational components in the interests of the whole system. This breadth of interest is an example of the "systems approach" in the sense that a system is an interconnected complex of functionally related components. Most operations research efforts begin with specific aspects of a general problem and proceed to consideration of the system as a whole. Just as the engineer may start with the study of subsystems or components of a general problem, so may the operations research analyst.

Admission

In addition to the requirements for admission to graduate study (see page 25), the applicant for the program in operations research leading to the degree of Master of Science must have an adequate knowledge of probability and statistics. This requirement can be met by satisfactory completion of the following undergraduate courses or approved equivalents: ApSc 115 and ApSc 116, *Engineering Analysis III* and *IV*. It is generally possible to take these courses concurrently with courses taken for graduate credit; however, in no case may these undergraduate courses fulfill any part of the requirements for the Master's degree.

Required Courses

Core courses required in the field of operations research are OR 201, 202, 209, 210, and 299–300 (for those electing a thesis) or 291 (for those not electing a thesis). Students must complete OR 201, 202, 209, and 210 before attempting any other courses; however, in certain cases, permission may be granted for concurrent registration. Students electing OR 291 normally complete this course in the last semester of the program. The remainder of the program is selected, with the approval of the adviser, in an area of concentration from courses in the Department of Operations Research. Appropriate courses from other departments of the University may also be approved as electives.

Areas of Concentration

The goal of the Department of Operations Research is to provide programs flexible enough to accommodate both those who are interested in applications and those who are interested in theory. Specific areas of concentration and suggested departmental electives follow:

GENERAL OPERATIONS RESEARCH

OR 251: Linear Programming
OR 252: Nonlinear Programming I
OR 261: Theory of Games
OR 275: Introduction to Scheduling
OR 277: Queuing Theory
OR 279: Inventory Control

With the approval of the adviser, other courses within the department may be elected.

ENERGY SYSTEMS

OR 251: Linear Programming
OR 252: Nonlinear Programming I
OR 271: Forecasting Techniques
OR 277: Queuing Theory
OR 279: Inventory Control

With the approval of the adviser, courses may be elected from the Department of Civil, Mechanical, and Environmental Engineering.

LOGISTICS ENGINEERING

OR 237: Logistics Planning
OR 251: Linear Programming
OR 253: Integer, Network, and Dynamic Programming
OR 271: Forecasting Techniques
OR 275: Introduction to Scheduling
OR 279: Inventory Control
OR 281: Reliability Theory I

With the approval of the adviser, courses may be elected from the Departments of Economics, Business Administration, Management Science, and Electrical Engineering and Computer Science.

MANAGEMENT SCIENCE

OR 232: Applications of Linear and Nonlinear Optimization Theory
OR 237: Logistics Planning
OR 251: Linear Programming
OR 261: Theory of Games
OR 271: Forecasting Techniques
OR 273: Digital Systems Simulation
OR 275: Introduction to Scheduling
OR 279: Inventory Control

With the approval of the adviser, courses may be elected from the Departments of Business Administration, Economics, Engineering Administration, and Management Science.

MATHEMATICAL MODELING IN INFORMATION SYSTEMS

OR 251: Linear Programming
OR 271: Forecasting Techniques
OR 273: Digital Systems Simulation
OR 275: Introduction to Scheduling
OR 277: Queuing Theory

With the approval of the adviser, courses may be elected from the Departments of Electrical Engineering and Computer Science, Engineering Administration, and Management Science.

MATHEMATICAL OPTIMIZATION

OR 251: Linear Programming
OR 252: Nonlinear Programming I
OR 253: Integer, Network, and Dynamic Programming
OR 261: Theory of Games
OR 275: Introduction to Scheduling

With the approval of the adviser, courses may be elected from applied science offerings and the Department of Mathematics.

MODEL BUILDING FOR TRANSPORTATION FLOWS

OR 231: Theory of Traffic Flow
OR 232: Applications of Linear and Nonlinear Optimization Theory
OR 251: Linear Programming
OR 252: Nonlinear Programming I
OR 273: Digital Systems Simulation
OR 277: Queuing Theory
OR 281: Reliability Theory I

With the approval of the adviser, courses may be elected from the Departments of Civil, Mechanical, and Environmental Engineering; Engineering Administration; and Urban and Regional Planning; and from the National Law Center.

OPERATIONS RESEARCH IN INDUSTRIAL ENGINEERING SYSTEMS

OR 232: Applications of Linear and Nonlinear Optimization Theory
OR 237: Logistics Planning
OR 251: Linear Programming
OR 252: Nonlinear Programming I
OR 271: Forecasting Techniques
OR 273: Digital Systems Simulation
OR 275: Introduction to Scheduling
OR 277: Queuing Theory
OR 279: Inventory Control
OR 281: Reliability Theory I

QUANTITATIVE DECISION-MAKING FOR PUBLIC POLICY

OR 232: Applications of Linear and Nonlinear Optimization Theory
OR 235: Operations Research in Public Policy
OR 236: Operations Research in Social Systems
OR 251: Linear Programming
OR 261: Theory of Games
OR 271: Forecasting Techniques
OR 273: Digital Systems Simulation

With the approval of the adviser, courses may be elected from the Departments of Civil, Mechanical, and Environmental Engineering; Economics; Public Administration; and Urban and Regional Planning.

STOCHASTIC MODELING

OR 271: Forecasting Techniques
OR 273: Digital Systems Simulation
OR 277: Queuing Theory
OR 279: Inventory Control
OR 281: Reliability Theory I

With the approval of the adviser, courses may be elected from the Department of Statistics.

PROFESSIONAL DEGREE PROGRAM

A program of advanced study and research leads to the degree of Applied Scientist. The program is designed to provide an educational opportunity for students interested in pursuing post-Master's study with emphasis on applied subject matter rather than on basic research.

Admission

In addition to the general requirements for admission to Professional degree study (see pages 31–34), admission requires an appropriate Master's degree from a recognized institution and evidence of a capacity for productive work as indicated by prior scholarship. The applicant must also possess a bachelor's degree in either engineering, mathematics, or administration. In certain cases applicants having an equivalent quantitative background may be considered for admission by the department.

Program of Study and Requirements

The program of study consists of an applied operations research major and an applied out-of-department minor. A minimum of 30 semester hours is required to earn the Professional degree, including a minimum of 12 hours in operations research, Stat 201–202, and a three-hour Professional degree project. In addition, a nine-hour applied minor outside the department is required. Appropriate minor areas include economics; engineering administration; systems analysis, computer science; systems science, networks and controls; urban and regional planning; transportation systems; environmental engineering; and energy systems.

DOCTORAL STUDY

Programs in operations research leading to the degree of Doctor of Science provide advanced study and research to enable students to extend their fields of knowledge and to enhance their career opportunities in research, analysis, management, administration, or education.

Admission

In addition to the general requirements for admission to doctoral study (see page 35), the applicant for the doctoral program in operations research must have a Master's degree, with a superior record of academic achievement. Outstanding professional performance is also considered in evaluating applicants.

Programs of Study

Doctoral programs are planned so that the student may obtain adequate breadth in operations research and sufficient depth in areas of specialization which will enable the completion of a dissertation that will be a significant contribution to the field. Possible areas of concentration include mathematical programming, sequencing and scheduling, inventory, queuing, and reliability. In addition to the major in operations research, two minor areas of concentration are normally required. One minor generally is in applied science, mathematics, or statistics. The second minor may be chosen from areas of concentration within the department or from appropriate areas available in other departments of the University, such as Business Administration; Civil, Mechanical, and Environmental Engineering; Economics; Electrical Engineering and Computer Science; Engineering Administration; Health Care Administration; Management Science; and Urban and Regional Planning. The general requirements for doctoral study are stated on pages 35–38.

OPERATIONS RESEARCH GRADUATE COURSES

201 **Survey of Operations Research Methods I** (3)

Basic concepts and techniques of operations research as applied to problems in industrial, governmental, and military decision making. Allocation models, including the simplex procedure of linear programming, transportation and assignment models; queuing theory; inventory theory; game theory; and decision-making under uncertainty. Prerequisite: ApSc 115 or equivalent. (Fall and spring)

202 **Survey of Operations Research Methods II** (3)

Simulation, Monte Carlo techniques; networks; integer programming; introduction to nonlinear programming; dynamic programming; reliability and replacement. Prerequisite: OR 201 or permission of instructor. (Fall and spring)

209 **Mathematics in Operations Research I** (3)

Fundamental methods and practical procedures for deterministic decision models in operations research involving a number of variables. Applica-

tions of linear models for resource allocations. Applications to data representation and algorithmic procedures for linear and nonlinear optimization models. Applications of linear algebra and real multivariate analysis. (Fall)

210 **Mathematics in Operations Research II (3)**

Fundamental methods and practical procedures for stochastic decision models in operations research involving applications of complex variables. Applications of linear differential, difference, and differential-difference systems to various areas in operations research. Applications of modern numerical methods. (Spring)

231 **Theory of Traffic Flow** (3)

Definitions and measurement of traffic stream parameters; dynamic theories: follow-the-leader models of traffic flow; kinematic theories and fluid analogies; traffic cybernetics; statistical distributions and queuing theory; stochastic approaches to static delay problems; simulation of traffic problems. Prerequisite: ApSc 115 or equivalent. (Spring, odd years)

232 **Applications of Linear and Nonlinear Optimization Theory** (3)

Introduction to penalty-function methods for solving linear and nonlinear optimization problems through use of existing computer codes. Formulation of optimization models in application areas of structural design, nutrition, pollution control, resource allocation, biology, economics, psychology, statistics, and chemical processes. Admission by permission of instructor. (Fall)

235 **Operations Research in Public Policy** (3)

Quantitative methods in health, education, and welfare. Health planning models, hospital operations analysis, analysis of educational systems, and welfare planning. Case studies include medical manpower planning, hospital admissions systems, comprehensive health care planning models, assessment of effects of innovation in education, determination of welfare priorities, and resource allocation in welfare problems. Prerequisite: knowledge of calculus and fundamentals of probability and statistics. Admission by permission of instructor. (Fall)

236 **Operations Research in Social Systems** (3)

Quantitative methods in urban development and the administration of justice. Studies of police operations; models for court management; analysis of correctional problems; location of public facilities; scheduling and routing problems; manpower usage; passenger, freight, and vehicular traffic problems; housing problems; models of emergency operations. Prerequisite: knowledge of calculus and fundamentals of probability and statistics. Admission by permission of instructor. (Spring)

237 **Logistics Planning** (3)

Quantitative methods in model building for logistics systems including organization, procurement, transportation, inventory, maintenance, and their interrelationships. Applications stressed. Prerequisite: ApSc 115 or equivalent. (Spring, even years)

251 **Linear Programming** (3)

Basic computational, theoretical, and applied areas with emphasis on the general linear programming problems; simplex procedures; duality prob-

lems; parametric linear programming and sensitivity analysis, transportation problems. Prerequisite: OR 201 or permission of instructor. (Fall and spring)

252 **Nonlinear Programming I** (3)

Basic topics in optimization theory, including first- and second-order optimality criteria, convexity, duality, and algorithms. Methods for solving unconstrained, linearly constrained, and nonlinearly constrained problems. Applications discussed where appropriate. Prerequisite: OR 202, or permission of instructor. (Spring)

253 **Integer, Network, and Dynamic Programming** (3)

Methods and applications of optimization problems requiring integral solutions. Cutting plane methods, branch and bound methods, group theoretic methods. Dynamic programming. Network programming: shortest route problems, max flow problems. Prerequisite: OR 202, 251; or permission of instructor. (Fall, even years)

261 **Theory of Games** (3)

Study of mathematical models with applications to the relationships among independent competitive entities (persons or organizations in environment of competition, bargaining, bidding), selection of optimum strategies, minimax concept, connections with linear programming and decision functions, two-person and n-person zero and nonzero sum games. Prerequisite: OR 201 or permission of instructor. (Fall)

271 **Forecasting Techniques** (3)

Introduction to various techniques of forecasting available to an operations research analyst or engineer. Topics include the use of regression analysis in forecasting and other heuristic forecasting techniques. Emphasis on detailed development of the Box-Jenkins technique for time-series analysis, including moving averages and exponential smoothing as special cases. Techniques covered will be applied to engineering, business, and economic situations, using special computer program packages. Prerequisite: ApSc 115, 116; or equivalent. (Spring, even years)

273 **Digital Systems Simulation** (3)

Monte Carlo techniques, random number and random deviate generation. Simulation languages. Operating considerations, including model validation, steady-state, and statistical analyses of simulation output. Applications in inventory, queuing, and production scheduling. Prerequisite: OR 201, 202, or permission of instructor; and knowledge of FORTRAN or BASIC. (Spring, odd years)

275 **Introduction to Scheduling** (3)

Theory of scheduling with emphasis on industrial applications; assembly line balancing; sequencing and scheduling of jobs in machine shops. Mathematical optimization, heuristic programming, and computer simulation approaches to these problems are examined. Prerequisite: OR 201 and 251; or permission of instructor. (Fall, odd years)

277 **Queuing Theory** (3)

Characterization of queuing systems. Single-channel exponential models. Additional Markovian single- and multiple-channel models, including birth-death processes, finite sources, bulk queues, Erlangian models, and series

queues. Models with general arrival and/or service patterns. Model-building, basic solution techniques, and formal theoretical developments are stressed. Prerequisite: ApSc 116, OR 201; or permission of the instructor. (Spring)

279 Inventory Control (3)

Application of mathematical techniques to decisions regarding when and how much to produce or purchase. Various mathematical models of inventory systems with deterministic and stochastic demands, continuous and periodic review policies, multi-item models with constraints. Demand uncertainty and forecasting in inventory models. Prerequisite: OR 201 or permission of instructor. (Fall)

281 Reliability Theory I (3)

Topics introducing the mathematical and statistical theories of reliability. Mathematical theory includes the theory of coherent structures, association of random variables, stochastic characterization of wear, total positivity, preservation theorems, and bounds and inequalities. Statistical theory includes probabilistic derivation of failure models; testing goodness-of-fit; censored, truncated, and sequential life testing procedures using classical and Bayesian techniques; testing reliability hypotheses and their applications in the commonly used military standard plans. Prerequisite: ApSc 115, 116; or equivalent. (Fall)

291 Problems in Operations Research (3)

Field experience in operations research on a team basis. Each small group locates an actual problem and formulates a solution by operations research models. Class evaluation of progress. (Fall and spring)

297 Special Topics in Operations Research (3)

Selected topics in operations research, as arranged. Prerequisite: permission of instructor. May be repeated for credit. (Fall and spring)

298 Research (arr.)

Basic or applied research in operations research. May be repeated for credit. (Fall and spring)

299–300 Thesis Research (3–3)

(Fall and spring)

351 Advanced Topics in Mathematical Programming (3)

Special topics selected from fractional and geometric programming, branch-and-bound methods, max-min problems, pseudo-Boolean programming, calculus of variations, optimal control, penalty function methods, Lagrangian algorithms, fixed point procedures, sensitivity analysis, and large-scale programming. Prerequisite: OR 252 or permission of instructor. (Spring)

352 Nonlinear Programming II (3)

Convex analysis, algorithmic convergence, and rate of convergence. Proofs of optimality conditions. Factorable programming and other problems with special structures. Matrix methods, sensitivity analysis, and nonconvex optimization. Prerequisite: OR 252 or permission of instructor. (Fall)

361 Decisions and Value Theory (3)

Subjective probability and utility theory. Optimal nonsequential and sequential decision processes: Bayes risks and Bayes decisions, randomization and mixed decisions. Optimal stopping. Prerequisite: ApSc 116, OR 201 and 202 (OR 261 is desirable); or permission of instructor. (Spring, odd years)

371 Advanced Topics in Forecasting (3)

Continuation of OR 271 designed for those who wish to develop further capability in this area. Topics include a brief review of OR 271, estimation of parameters of Box-Jenkins models, transfer function models for relating two or more time series, models for intervention analysis, and models for feedforward and feedback control schemes. Also, other techniques and concepts useful in forecasting, such as spectral analysis of time series, including cross-spectral analysis and Fourier analysis. Review and discussion of current literature. Prerequisite: OR 271 or equivalent, or permission of instructor. (Fall, even years)

377 Advanced Stochastic Models in Operations Research (3)

Selected applied probability models, including Brownian motion, renewal theory, denumerable Markov chains, semi-Markov processes, and Markov decision problems. Applications to topics in advanced queuing and inventory theories, including busy periods, waiting times, imbedded Markov chains, and GI/G/1 queues; and conditions for optimality of (s, S) policies, stochastic leadtime problems, state-dependent leadtimes, and multi-echelon problems. Prerequisite: OR 277, 279; or permission of instructor. (Fall, odd years)

381 Reliability Theory II (3)

Topics of current interest in the mathematical and statistical theories of reliability. Mathematical theory includes stochastic characterization of multivariate survival, shock models and wear processes, stochastic majorization and its applications, and reliability theory for multi-state components. Statistical theory includes total time on test processes and plots, goodness-of-fit tests using total time on test plots, estimation and forecasting failure rates, and comparison of stochastic processes. Prerequisite: OR 281. (Spring, even years)

391 Project for Professional Degree (3)

Limited to students in the Professional degree program. (Fall and spring)

397 Advanced Topics in Operations Research (3)

Advanced topics from the literature of operations research for analysis, presentation, and discussion. Reading assignments from professional journals selected by the instructor and the student. May be repeated for credit. Admission by permission of instructor. (Fall and spring)

398 Advanced Reading and Research (arr.)

Limited to students preparing for the Doctor of Science qualifying examination. May be repeated for credit. (Fall and spring)

399 Dissertation Research (arr.)

Limited to Doctor of Science candidates. May be repeated for credit. (Fall and spring)

Required Courses in Engineering Undergraduate Curricula Offered by Columbian College of Arts and Sciences and by the Graduate School of Arts and Sciences

For convenience, descriptions of required courses in undergraduate curricula which are offered by Columbian College of Arts and Sciences and the Graduate School of Arts and Sciences are listed here. See the *Undergraduate and Graduate Bulletin* for elective courses in the humanities and social sciences.

BIOCHEMISTRY

221–22 **General Biochemistry** (3–4)

A comprehensive course in general biochemistry for graduate students in biomedical sciences and undergraduate students in biology and chemistry. Generally, graduate students *must* register concurrently for Bioc 223, and for Bioc 224. However, graduate students taking Bioc 225–26, ForS 281–82, Micr 241–42, or Phys 223–24 may register for Bioc 221–22 without the laboratory. With specific recommendations by the undergraduate adviser and the Department, undergraduate students may register for Bioc 221–22 without the laboratory. Prerequisite: Chem 152, 154. (Academic year)

BIOLOGICAL SCIENCES

Biology

11–12 **Introductory Biology for Science Majors** (4–4)

Lecture (3 hours), laboratory (3 hours). BiSc 11: Biological concepts and principles are demonstrated through consideration of the plant as an organism. BiSc 12: Beginning principles of inheritance, development, behavior, physiology, systematics, and evolution, using animals as the subject of investigation; designed to furnish a base for advanced studies in biology and related sciences. Prerequisite to BiSc 12: BiSc 11. Material fee, $24 a semester. (Academic year)

Zoology

145 **Introduction to Vertebrate Embryology** (4)

Lecture (2 hours), laboratory (4 hours). Origin and early development of the individual, formation of organ systems. Emphasis on frog, chick, and pig, with reference to human embryo. Material fee, $24. (Fall)

148 **Histology** (4)

Lecture (2 hours), laboratory (4 hours). Introduction to microscopical anatomy of normal tissues and organs with emphasis on the interrelationship of structure and function. Material fee, $24. (Fall and spring)

CHEMISTRY

13 **General Chemistry** (4)

For engineering and applied science students only. Lecture (3 hours), laboratory (3 hours), recitation (1 hour). Atomic structure, chemical

bonding; chemical equations; acids and bases; chemical equilibrium; liquid and solid states; periodicity; electrochemistry; organic chemistry. Prerequisite: Math 31, Phys 14 or 15. Laboratory fee, $28. (Fall)

22 Introductory Quantitative Analysis (4)

Lecture (2 hours), laboratory (6 hours). Theory and practice of quantitative analysis by classical methods; introduction to instrumental analysis. Prerequisite: Chem 12. Laboratory fee, $28. (Fall and spring)

151–52 Organic Chemistry (3–3)

Chemistry of the compounds of carbon. Prerequisite to Chem 151: Chem 12 or 16. Prerequisite to Chem 152: Chem 151. (Academic year)

153–54 Organic Chemistry Laboratory (1–1)

Laboratory complement of Chem 151–52. Prerequisite or concurrent registration: Chem 151–52. Prerequisite to Chem 154: Chem 153. Laboratory fee, $28 a semester. (Academic year)

ENGLISH

***9 English Composition: Language as Communication (3)**

Intensive grammar and composition course for students inadequately prepared for Engl 10. Detailed instruction, drill, and exercises in basic structure in writing paragraphs; also includes content covered in Engl 10. In addition a noncredit reading course, given by the Reading Center, is required for students whose test scores show a reading deficiency. Engl 9 meets five hours per week and carries three semester hours of credit; the reading course meets an additional three hours a week for a maximum of 10 weeks. Special fee, $25. (Fall and spring)

***10 English Composition: Language as Communication (3)**

Study and practice of expository techniques; emphasis on the rhetorical complexities of unity, development, organization, and coherence, by analysis of selected current prose; library research procedure. (Fall and spring)

GEOLOGY

136 Engineering Geology (3)

For students in the School of Engineering and Applied Science. Geological principles and processes and their application to civil and mechanical engineering. Prerequisite: Math 31, Phys 2 or 4; or permission of instructor. (Spring)

MATHEMATICS

30–31 Precalculus and Single-Variable Calculus I (3)

(Formerly Precalculus and Calculus of One Variable)

A one-semester combination of Math 30 *Precalculus* and Math 31

* Students whose College Board English Composition Achievement Test scores suggest inadequate preparation may be assigned to Engl 9 or may be tested in vocabulary, spelling, grammar, standard usage, and writing skill, before placement in either Engl 9 or 10. Students whose scores and/or writing skill indicate superior competence will be allowed to waive the Engl 10 requirement.

† Transfer students who have not successfully completed a college-level calculus course with a grade of C or better from an accredited institution, or high school students who did not take an advanced placement (AP) calculus course and receive a score of 4 or 5 on the AP test, will be required to take a one-hour locally administered math placement test at registration. This test covers algebra, trigonometry, and graphs. Students who do not place directly into Math 31 as a result of this test will be required to undertake a combined pre-calculus and calculus course, Math 30-31, during their first semester; this combined course meets five hours per week and carries three semester hours of credit if the student successfully completes the second half, Math 31, of the combined course.

Single-Variable Calculus I. The course meets five hours per week a carries three semester hours of credit. After completing the first half the course (Precalculus), students are examined in precalculus. Studen who pass the test continue in Math 30–31. Students who fail the te transfer to a regular Math 30 course for the remainder of the semeste

30 **Precalculus** (3)

Set theory, inequalities, basic analytic geometry, functions and relation Polynomial, trigonometric, logarithmic, and exponential functions. Pre requisite: Math 3 and 6; or one and one-half years of high school algebra one year of high school geometry, and one-half year of high scho trigonometry; or equivalent. (Fall and spring)

31 **Single-Variable Calculus I** (3)
(Formerly Calculus of One Variable)

Differentiation and integration of algebraic functions, exponentials and logorithms with simple applications. Analytic geometry. Prerequisite Math 30 or equivalent. (Fall and spring)

32 **Single-Variable Calculus II** (3)
(Formerly Calculus of Several Variables)

Calculus of trigonometric functions. Techniques of integration. Indefinite series; vectors; 3-dimensional analytic geometry. Prerequisite: Math 3. (Fall and spring)

33 **Multivariate Calculus** (3)
(Formerly Calculus of Vector Functions)

Vector-valued functions. Partial differention. Multiple integrals. Topics in vector calculus. Prerequisite: Math 32. (Fall and spring)

32–33 **Single-Variable Calculus II and Multivariate Calculus** (6)
(Formerly Calculus of Several Variables and Calculus of Vector Functions)

A one-semester combination of Math 32 and 33, meeting five hours per week.

113 **Graph Theory** (3)

Directed and undirected graphs; bridges, cutpoints, and blocks; connectivity; partitions; Eulerian and Hamiltonian graphs; planarity; coloring problems. Flow charts for computer applications. Prerequisite: Math 32. (Spring)

121–22 **Introduction to Abstract Algebra** (3-3)

Selected topics in elementary number theory, groups, rings (including polynomial rings), and fields. Open to sophomores with permission of department. Prerequisite: Math 32 or permission of instructor. (Academic year)

124 **Introduction to Matrix Theory** (3)

Operations on matrices, linear equations, matrix inversion, vector spaces, characteristic roots and vectors. Hamilton-Cayley Theorem. Systems of linear difference and differential equations. Quadratic forms. Applications to economic, biological, and physical models. Prerequisite: Math 32 or permission of instructor. (Fall and spring)

139 **Advanced Calculus I** (3)

Topology of R^n. Continuous mappings. Uniform convergence. Differentiable mappings. Prerequisite: Math 33. (Fall and spring)

140 **Advanced Calculus II** (3)

Contraction maps, implicit function and differential equation theorems. Integration theory. Fourier series. Prerequisite: Math 139 or equivalent. (Spring)

153 **Introduction to Numerical Analysis** (3)

Introduction to fundamentals of numerical analysis using modern digital computers. Solution of linear systems and of ordinary differential equations. Interpolation polynomials. Iterative solution of nonlinear equations. Simple quadrature techniques. Prerequisite: Math 33 or equivalent. (Fall, even years)

154 **Difference Equations** (3)

Introduction to finite difference equations and their solution. Physical examples and analogies with differential equations are employed to motivate and apply the techniques developed. Generating functions. Analysis of error and stability characteristics. Prerequisite: Math 111 or 139, or equivalent. (Spring, odd years)

PHYSICS

3 **Foundations of Physics** (3)

Lecture (2 hours), recitation (1 hour). Development of conceptual principles underlying modern physical knowledge; basics of mechanics, heat and electromagnetism, including the classical concepts of energy, momentum, heat, temperature, entropy, electric and magnetic fields, optics. Prerequisite: two years of college preparatory mathematics or concurrent registration in Math 6.

14 **Introductory Mechanics and Thermal Physics** (3)

Lecture (2 hours), recitation and laboratory (2 hours). Physical principles of mechanics and thermal physics utilizing tools of calculus. Topics emphasized are vector calculus, equilibrium phenomena, kinematics, Newton's Laws, conservation of mass, momentum and energy, rotational motion, small vibrations, thermometry, macroscopic and microscopic properties of ideal gases, the laws of thermodynamics, thermal properties of solids and liquids. Prerequisite: Phys 3 or equivalent, Math 31. Laboratory fee, $18.

15 **Elements of Electricity and Magnetism** (3)

Lecture (2 hours), recitation and laboratory (2 hours). Introductory aspects of electromagnetic theory. Topics include static electric fields, Coulomb's law, Gauss' Law, electric potential, capacitance and dielectrics, electric current and resistance. Ampere's Law, Faraday's Law, Maxwell's equations in integral form, electromagnetic waves. Prerequisite: Phys 3 or equivalent, Math 31. Laboratory fee, $18.

16 **Introduction to Modern Physics** (3)

Lecture (2 hours), recitation and laboratory (2 hours). Elementary approach to basic principles of quantum theory. Topics include wave-par-

ticle duality, the hydrogen atom, Pauli's exclusion principle, X-ray spec the atomic nucleus, radioactivity, nuclear reactions, statistical distribut laws, applications to molecular and solid state physics. Prerequis Phys 14, 15, Math 32. Laboratory fee, $18.

STATISTICS

117 **Analysis of Variance** (3)
Lecture (3 hours), laboratory (1 hour). Introduction to the design experiments and analysis of variance; random block, factorial, La square, and analysis of covariance. Prerequisite: Stat 118. Laboratory fe $18. (Spring)

118 **Regression Analysis** (3)
Lecture (3 hours), laboratory (1 hour). Regression and correlation theor simple, partial, and multiple. Prerequisite: 3 semester hours selec from Stat 51, 53, 91. Laboratory fee, $18. (Fall and spring)

159 **Principles of Bayesian Statistics** (3)
Lecture (3 hours), laboratory (1 hour). Probability as a measure of u certainty of knowledge; concepts and techniques of Bayesian inferen Prerequisite: three semester hours in introductory statistics, or equiv lent. Laboratory fee, $13.

187 **Theory of Sampling** (3)
Problems of sampling and sample design. Prerequisite: Stat 91 or equi alent. (Fall)

188 **Nonparametric Statistical Inference** (3)
Statistical inference when the form of the underlying distribution is n specified. Prerequisite: Stat 91 or equivalent. (Spring)



GENERAL INFORMATION

Registration

THE DATES, HOURS, AND PLACE OF REGISTRATION will be stated in the *Schedule of Classes*, which is available well in advance of each semester.

New and readmitted students cannot register for classes without having received a letter of admission to the University issued by the appropriate admitting office.

No registration is accepted for less than a semester or less than one summer session.

Students may not register concurrently in this University and another institution without the prior permission of the dean of the college, school, or division in which the student is registered in this University. Registration in more than one college, school, or division of the University requires the written permission of the deans concerned, *prior to registration*. Allowance of credit for work done concurrently at another institution is at the discretion of the appropriate committee.

ELIGIBILITY FOR REGISTRATION

Registration for the following categories of campus students is held on the days of registration stated in the University Calendar. A student who is suspended or whose record is not clear for any reason is not eligible to register.

New Student.—Upon receipt of a letter of admission, the new student is eligible for registration on the stated days of registration.

Readmitted Student.—A student previously registered in the University who was not registered for campus courses during the preceding semester or summer session must apply for and receive a letter of readmission from the appropriate admitting office before the student is eligible for registration.

Continuing Student.—The student registered for campus courses in the immediately preceding semester or the Summer Session preceding the fall semester is eligible to register, assuming good standing and enrollment in a continuing program.

REGISTRATION CHANGES AND WITHDRAWALS (see pages 201–202, 209–210)

Registration for Consortium Courses

Degree students interested in taking courses at any of the other institutions in the Consortium of Universities of the Washington Metropolitan Area, Inc. should consult the program announcements of the other institutions. Con-

sortium application forms and instructions may be picked up in the Off of the Registrar after obtaining registration materials. In order to parti pate in the Consortium program, students must obtain the approval of an viser and should ascertain from the department of the institution where course is taught whether they are eligible for the course and whether there space in the class. Specific inquiries should be addressed to the Registrar.

Fees and Financial Regulations

FEES PAID BY STUDENTS cover only a portion of the cost of the operation of th University. Income from endowment funds, grants, and gifts from alumni a friends of the institution makes up the difference.

The following fees and financial regulations were adopted for the 19 summer sessions and the 1979–80 academic year. (See page 200 for projecte tuition and fee increases for 1980–83.)

Tuition Fees

For undergraduate study:

Full-time program (12 or more hours a semester)	$1,700.0
Part-time program, for each semester hour	119.0
Summer Sessions, for each semester hour	112.0

For graduate study*

For each semester hour for which the student registers	119.0

Doctoral students are required to register for minimum hour-loads,† as follows:

1. Full-time doctoral students must register for a minimum of 12 semester hours a semester until 24 hours of work have been completed beyond the qualifying examination; and a minimum of 4 semester hours a semester thereafter until the satisfactory completion of the final examination.
2. Part-time doctoral students must register for a minimum of 6 semester hours a semester until 24 hours of work have been completed beyond the qualifying examination; and for a minimum of 4 semester hours a semester thereafter until the satisfactory completion of the final examination.

University Center Fee

(Charged all students registered on campus‡)

For students registered for 11 or more semester hours on campus:	
Each semester	$50.00

* Registration in thesis courses (299-300) entitles the student, during the period of registration, to the advice of the member of the faculty under whom the thesis is to be written. In case a thesis is unfinished an additional semester will be granted. If the preparation of the thesis extends beyond the three-semester period, approval for this extension will be required, and the student must repeat the thesis course 300 and pay tuition as for a repeated course, provided the overall time limit for earning the degree is not exceeded.

† No minimum hour-load is required during the summer sessions.

‡ Students in off-campus programs are charged the University Center Fee only when registered for courses on campus.

For students registered for less than 11 semester hours in a semester on campus:

For each semester hour for which the student registers $4.75

Additional Course Fees

In certain courses additional fees, such as laboratory and material fees, are charged as indicated in the course description. These fees are charged by the semester and, unless otherwise indicated, may be defrayed in two payments when the tuition is paid in this manner. Breakage of apparatus is charged against the individual student. When breakage is in excess of the normal amount provided for in the laboratory fee, the individual student will be required to pay such additional charges as are determined by the department concerned.

Graduation Fees

Bachelor's, Master's, Doctor's degrees $25.00
Fee for binding Master's thesis 15.00
Fee for microfilm service and printing announcement of final examination for Doctoral degree 65.00

Residence Hall Fees (see pages 217–218).

Special Fees and Deposits

Application fee (undergraduate degree candidates) nonrefundable $15.00
Application fee (graduate degree candidates), nonrefundable 25.00
Advanced tuition deposit, nonrefundable, charged each entering or readmitted full-time undergraduate student 100.00
Housing deposit, nonrefundable, charged each applicant for residence hall space 100.00
Admission tests (when required) 6.00–12.00
Late-registration fee, for failure to register within the designated period.... 15.00
Late-payment fee, for failure to make payments when due (see "Payment of Fees," page 200) 15.00
Financial reinstatement fee, for reinstatement after financial encumbrance for nonpayment of fees (see "Payment of Fees," page 200) 35.00
Returned check fee, charged a student whose check is improperly drafted, incomplete, returned by the bank for insufficient funds, or returned for any other reason 15.00
Engineers' Council fee, charged each student in the School of Engineering and Applied Science for each semester or any part thereof except the summer term 5.00
Special Columbian College of Arts and Sciences departmental examination for each course to qualify for receiving credit (advanced standing), waiver of requirement, or both 25.00
For each waiver examination to qualify for advanced placement 5.00
English test for international students (when required) 10.00
Laboratory checkout fee, for failure to check out of chemistry laboratory by the date deadline set by the instructor* 10.00
Transcript fee, for each transcript of record 2.00
If two or more transcripts are requested at the same time, fee for each of the first two copies is $2 each; fee for additional copy ..... .50
Replacement of lost or stolen picture identification card 2.00

Registration for on-campus courses in the University entitles each student to the following University privileges: (1) the services of the Student and Alumni

* A student who drops a chemistry course before the end of the semester must check out of the laboratory at the next regular laboratory period

Career Services Office; (2) the use of the University Library; (3) gymnasi privileges; (4) admission to all athletic contests, unless otherwise specified; (subscription to the *University Hatchet*, the student newspaper; (6) admission University debates; (7) medical attention as described under Student He Service. These privileges terminate when the student withdraws or is dismiss from the University.

PROJECTED TUITION AND FEE INCREASES FOR 1980–83

In order that students and their parents may plan more realistically for a to four-year period, tuition increases for the academic years 1980–81, 198 82, and 1982–83 have been established as follows:

Increase by year (full-time undergraduate students):

1980–81	$300.0
1981–82	200.0
1982–83	250.0

Increase by semester hour (graduate and part-time undergraduate students):

1980–81	$18.0
1981–82	8.0
1982–83	9.0

It is not possible to project future economic data with certainty. The in creases outlined above are merely estimates based on present circumstance and should in no way be interpreted as fixed limits on tuition increases. Th University hopes to keep tuition increases as low as possible, but it is obligate to maintain a sound financial basis. Economic conditions in the recent pas particularly as they affect private educational institutions, have been extreme variable, and significant increases in tuition in excess of the above limits ma be required.

PAYMENT OF FEES

No student is permitted to complete registration or attend classes until al charges are paid. Tuition and fees for each semester are due and payable i full at the Office of the Cashier at the time of each registration. Checks an postal money orders should be made out to George Washington University with the student identification number in the upper left-hand corner.

The Student Accounts Office has responsibility for billing and maintaining student accounts for tuition, various fees, and room and board charges. A stu dent registered for six semester hours or more may sign a deferred payment contract with the Student Accounts Office at the time of each registration per mitting payment of one-half of the total tuition and fees (except for fees pay able in advance) at the time of registration and the remaining half on or be fore October 24, 1979 (for the fall semester), and March 5, 1980 (for the spring semester). Interest at the rate of eight per cent per annum on the un paid balance will be charged from the date of registration to the date payment is made.

Students receiving tuition assistance in the form of scholarships, government tuition contracts, or other forms of tuition awards are not permitted to sign deferred payment contracts unless the total tuition and fee charges exceed the value of the tuition awards by $750 or more. Under such circumstances the

student may be permitted to pay one-half of the amount due from the student at the time of registration and to defer the balance by signing a deferred payment contract.

Students who fail to make any payment when due will be automatically charged a $15 late-payment fee and will be subject to the interest charge of eight per cent per annum. Accounts which become 30 days past due will be financially encumbered. In the event a student's account is financially encumbered, the student forfeits his right to the use of deferred payment contracts in future semesters, and the Student Accounts Office will notify the Registrar to withhold grades, future registration privileges, transcripts, diplomas, and other academic information until the account is settled financially. Financial settlement will require payment in full of all amounts due the University in addition to a financial reinstatement fee of $35.

Students auditing courses are subject to all fees charged to students registered for credit.

PREPAID AND DEFERRED PAYMENT PLANS FOR PARENTS

Several commercial programs for parents who wish to pay for college on a monthly basis are available. Terms and conditions vary, but most provide a life insurance policy in the contract. For specific details and applications, address inquiries to the following:

1. Girard Edu-Check Plan, 2nd and Chestnut Streets, Philadelphia, Pa. 19106
2. Richard C. Knight Insured Tuition Payment Plan, 6 St. James Avenue, Boston, Mass. 02100
3. The Tuition Plan, Inc., Concord, N.H. 03301
4. School-Chex, Irving Trust Company, P.O. Box 12231, Church St. Station, New York, N.Y. 10249.

The University's Office of Student Financial Aid does not maintain a supply of applications for these various programs, but will be happy to provide guidance to students and parents.

WITHDRAWALS AND REFUNDS*

Applications for withdrawal from the University or for change in class schedule are made by completing the George Washington University Change Slip (obtainable in Room 103, Tompkins Hall), securing the approval of the appropriate faculty, and submitting the form to Room 103 for the dean's signature. Notification to an instructor is not an acceptable notice (see "Withdrawal," pages 209–210.)

Withdrawal and Change in Course Status

Courses may be dropped by undergraduate and graduate students without academic penalty only during the 28 days following the first day of classes, with the approval of the instructor, the student's adviser, and the Associate Dean.

The status of a course may not be changed from credit to audit or vice-versa after the 28th day after classes have started for the semester.

For other regulations governing withdrawal and changes in program, see pages 209–210.

* Regulations concerning withdrawals and refunds for the Summer Sessions are stated in the *Summer Sessions Schedule of Classes.*

In authorized withdrawals and changes in schedule, cancellations of semester tuition charges and fees will be made in accordance with the following schedule for the fall and spring semesters:

1. *Complete withdrawal* from the University:

   Fall Semester

   Withdrawal dated on or before September 7, 1979 ..... 90 per cent
   Withdrawal dated September 10 to September 21, 1979 ..... 75 per cent
   Withdrawal dated September 24, to October 5, 1979 ..... 50 per cent
   Withdrawal dated after October 5, 1979 ..... none

   Spring Semester

   Withdrawal dated on or before January 8, 1980 ..... 90 per cent
   Withdrawal dated January 21 to February 1, 1980 ..... 75 per cent
   Withdrawal dated February 4 to February 15, 1980 ..... 50 per cent
   Withdrawal dated after February 15, 1980 ..... none

2. For a *change in status from full-time to part-time student* or for *partial withdrawal by a part-time student*, the above schedule applies to the difference in charges between the original program and the adjusted program continuing in effect.
3. A student enrolled in an undergraduate full-time program who drops or adds a course and continues to be in a full-time program will have no financial adjustments of tuition made other than those involving course fees.
4. A student who is granted leave before completing the semester will receive credits for current charges in accordance with the schedule for complete withdrawal from the University (see No. 1, above). Payments made in excess of the nonrefundable balance will be refunded to the student.
5. Regulations governing student withdrawals as they relate to residence hall and food service charges are contained in the specific lease arrangements.

In no case will tuition be refunded or reduced because of absence from classes.

Payment applies only to the semester for which a registration charge is incurred and will not be credited to another semester.

Authorization to withdraw and certification for work done will not be given a student who does not have a clear financial record.

Students are encouraged to provide their own cash funds until they can make banking arrangements in the community.

Financial Aid*

FOR UNDERGRADUATE STUDENTS

GEORGE WASHINGTON UNIVERSITY offers a program of financial assistance of two basic types: awards for academic achievement without reference to financial circumstances—honor scholarships; and scholarships, grants, loans, and employment based upon demonstrated financial need. Applicants may apply for only *one* type of aid: need-based or honor.

* For information concerning financial aid for students from foreign countries, see page 20

Academic Merit Only

Engineering Honors Scholarships (EHS)

This program was initiated to recognize academically talented students who wish to study at the School of Engineering and Applied Science. The scholarships are awarded on the basis of merit only and "financial need" is not a requirement for consideration. Applicants with financial need should apply for need-based aid, *not* for EHS. The EHS is available to entering freshmen and to transfer students who have (or will have by the time of entrance to SEAS) completed 30 credit hours of college-level work which includes 6 credit hours of calculus or higher math and 3 credits of either physics or chemistry.

These scholarships cover one-half the tuition costs of attending SEAS and will be awarded to qualified students for up to four years, as long as scholarship criteria are met with the option of a fifth year if the student wishes to obtain a Master's degree.

Minimum Criteria for Initial Consideration of Incoming Freshman

The minimum criteria in the EHS Program will be based on merit in which the student has:

—achieved a minimum combined SAT score of 1250 or better; or an average ACT score of 28 or better in the English/mathematics/science tests; and ranked in the upper 10% of the class over 3 years or more;

or

achieved a minimum combined PSAT score of 125 or better;

—ranked at the end of the junior year in the upper 10% of the class over a period of 3 years or more;

—achieved an average grade of 85%, or better, at the end of the junior year, in mathematics and science courses taken during the previous 3 years.

Minimum Criteria for Initial Consideration of Incoming Transfer Students

The minimum criteria in the EHS Program will be based on merit in which the student has:

—completed (or will have completed at the end of the present semester) 30 credit hours in an accredited community college, college or university;

—completed courses which must include, at least, 6 credit hours of college calculus or higher mathematics, and, at least, 3 additional hours of college level physics or chemistry;

—achieved an overall quality point index of at least 85% (3.4) and a combined average of 80% (3.2) in the mathematics and science courses.

Need-Based Financial Aid

The University offers extensive programs of scholarships, grants, loans, and employment based upon demonstrated need. The University participates in the National Direct Student Loan, Basic Educational Opportunity Grant, Supplemental Educational Opportunity Grant, and the College Work-Study programs.

Applications and supporting credentials for financial aid other than Engineering Honors Scholarships must be filed by February 1 (entering freshmen) or March 1 (enrolled undergraduate or entering transfer students) preceding the academic year of the award for the fall semester; by November 1 for the spring semester; and by April 1 for the summer sessions.† A student must re-apply for financial aid each year.

Application deadlines for Engineering Honors Scholarships vary according to the category of student. Applicants with financial need should apply for need-based aid, *not* for EHS. Information on deadline dates is contained in the application forms.

Complete information concerning financial assistance is contained in the pamphlet, "Student Financial Aid," which is available at the Office of Student Financial Aid, George Washington University, Washington, D.C. 20052.

Scholarships and Grants

Scholarships are awarded for the academic year unless otherwise specified and are credited in equal parts for each semester. Each holder must carry a full schedule of academic work during the period for which the scholarship is awarded. Most of the following scholarships are limited to students in the School of Engineering and Applied Science. The University also offers other scholarships which are open to engineering students.

Frederick Albert and Alma Hand Britten Scholarships (1959).—Bequest of Alma Hand Britten for scholarship assistance to students entering the School of Engineering and Applied Science who would not otherwise be able to pursue such professional study. Available for undergraduate and graduate study.

American Association of Cost Engineers Scholarship (1977).—Established by American Association of Cost Engineers for scholarship assistance to a full-time student, graduate or undergraduate, majoring in a curriculum which includes courses related to cost engineering.

Henry Harding Carter Scholarship (1896).—Established by Maria M. Carter in memory of her husband to aid a deserving student who is preparing for the civil engineering profession. Available to students working toward the degree of Bachelor of Science (Civil Engineering).

Henry Parsons Erwin Scholarship (1955).—Established by Helen B. Erwin as a memorial to her husband, a former Trustee of the University. A partial scholarship for a student in Engineering and Applied Science.

Louis E. Giles Memorial Scholarships (1966).—Bequest of Susie E. Giles in honor and memory of her husband for scholarships to undergraduate and graduate students in the School of Engineering and Applied Science requiring financial assistance.

The George Hyman Construction Company Scholarships (1974).—Established by the George Hyman Construction Company to aid deserving students preparing for the civil engineering profession. These partial tuition undergraduate scholarships begin in the fall semester and extend for four years, provided the holder maintains a *B* average based upon a full course load leading to a degree in civil engineering and continues to be in financial need.

† Summer Sessions students are eligible for consideration only if they were enrolled in this University for at least 8 semester hours in the immediately preceding spring semester or have applied for financial aid for the following fall semester.

National Fund for Minority Engineering Students Scholarship (1977).—Scholarship for minority students who require financial assistance of up to $2000 and are in good academic standing. Minority students are defined as full time students of black, Puerto Rican, American Indian or Chicano descent, who are U.S. citizens or permanent residents, and who are entering an engineering school or university for the first time.

George Washington University Board of Trustees Scholarships.—Full and partial tuition undergraduate scholarships which begin in the fall semester and extend for four successive academic years, provided the holder maintains a *B* average, and continues to be in financial need. Candidates must plan to select a curriculum leading to a Bachelor's degree.

FOR GRADUATE STUDENTS

Scholarships, Fellowships, Assistantships

The George Washington University program of financial assistance for graduate students includes assistantships, fellowships, traineeships, graduate scholarships, research appointments, part-time employment, and loans. Application for admission to graduate study is a prerequisite for consideration.

Application and correspondence concerning assistantships, fellowships, traineeships, or graduate scholarships should be sent directly to the department concerned and addressed to George Washington University, Washington, D.C. 20052. Unless otherwise specified, the application and supporting credentials should be submitted not later than February 1 preceding the academic year for which the award is made.

Frederick Albert and Alma Hand Britten Scholarships (1959).—See p. 204.

American Association of Cost Engineers Scholarship (1977).—See p. 204.

Paul H. and Margaret M. deMaine Scholarships (1967).—Full and partial scholarships for graduate students whose research involves the use of computers. Inquiries should be made to the Director of the Center for Academic and Administrative Computing of the University.

Louis E. Giles Memorial Scholarships (1966).—See p. 204.

Phi Delta Gamma Scholarship Endowment Fund (1968).—Established by the Beta Chapter of Phi Delta Gamma, national fraternity for graduate women. For graduate women students.

National Science Foundation Graduate Fellowships.—Fellowships leading to graduate degrees in the mathematical, physical, medical, biological, engineering, and social sciences, and in the history and philosophy of science; providing tuition, fees, and stipends. Open to students who have been admitted to graduate status and who have completed less than one calendar year of graduate study. Applications should be made to the Fellowship Office, National Research Council, 2101 Constitution Avenue, N.W., Washington, D.C. 20418.

Research Assistantships in Operations Research and Related Fields.—Available to graduates, and to undergraduates on the junior and senior levels, in any school of the University. Research Assistants are expected to work 20 hours a week conducting research in support of an established research program or in programming or in conducting individual research on an approved research project. Stipends range up to $8,500, depending on the status of the student and the tenure of the appointment (9–12 months). Further information and applications are available from Director, Institute for Management Science and

Engineering, School of Engineering and Applied Science, George Washington University, Washington, D.C. 20052.

Research Assistantships in Engineering Administration.—Available to graduates in any Engineering Administration program. Research Assistants are expected to work 20 hours a week conducting research in support of an established research program. Stipends range up to $8,500 depending on the status of the student and the tenure of the appointment (9–12 months). Further information and applications are available from the Chairman, Department of Engineering Administration.

Research Scholar Assistantships, GWU—NASA-Langley Program.—See page 42.

Resident Assistantships (men and women).—Available to graduate students and seniors in any field of study who are interested in working with the student personnel program in University residence halls. Specific duties vary with the position, but basically consist of counseling, advising student groups, and administration. Remuneration includes partial tuition and a furnished room for the academic year. All positions are part-time, and staff members are required to enroll as full-time students in degree granting programs. Further information may be obtained from the Office of the Director of Housing.

SPONSORED AWARDS FOR GRADUATE STUDY

Information regarding awards sponsored by foundations, professional and learned societies, industries, and others which may be used in support of graduate study is available at the Graduate Fellowship Information Center, 2025 H St., N.W., for students enrolled at George Washington University. Information is also available on distinguished programs such as the Rhodes, Marshall, National Science Foundation, Fulbright, Rotary International, and Danforth as well as many others.

Since deadlines for application vary, qualified students should make inquiries well in advance of the year of planned graduate study.

LOAN FUNDS

Several loan funds are available to students in the University in accordance with the qualifications specified by the donors. Two loan programs limited to students in the School of Engineering and Applied Science are available. Students should direct inquiries to and file applications with the Office of Student Financial Aid. Applications for the National Direct Student Loan should be filed no later than April 1 for the following academic year. Complete information is contained in the pamphlet, "Student Financial Aid," available in the Office of Student Financial Aid, George Washington University, Washington, D.C. 20052.

Warren Stickler Memorial Loan Fund (1966).—A fund established by the Precision Measurements Association as a memorial to Warren Stickler is available to engineering students.

John Brewster Willis, Jr., Loan Fund in Mechanical Engineering.—Established by Mrs. William L. Lane as a memorial to her nephew, John Brewster Willis, Jr. Available to Mechanical Engineering students (graduate or undergraduate) who are primarily interested in aeronautics.

Two short-term emergency loan funds are also available at the University. Information concerning these funds is available from the Office of Student Financial Aid.

STUDENT EMPLOYMENT

The University participates in the College Work-Study Program. Inquiries should be addressed to the Office of Student Financial Aid. In addition, the Student and Alumni Career Services Office maintains a registry of both full-time and part-time positions available in the Washington area for undergraduate and graduate students.

After registration, students may apply at the Student and Alumni Career Services Office, Woodhull House, 2033 G Street, N.W., for interviews and referrals to positions for which they are qualified.

INTERNATIONAL STUDENTS

Undergraduate international students with proven financial need who have completed one semester of full-time work (15 hours) at this University with a *B* average are eligible to apply for the Board of Trustees Scholarships. Scholarships are awarded in the spring for the following academic year. See instructions for applying for undergraduate financial aid, page 202.

Limited awards for graduate teaching assistantships and University fellowships are the responsibility of the chairman of the department or dean of the school in which the degree is to be earned. Work as a teaching fellow requires excellent knowledge of English—both spoken and written.

Long-term loan funds for undergraduate and graduate international students are limited in amount and are available only to those foreign-born persons who have established resident status in the United States through the Immigration and Naturalization Service.

Students who wish to study in the United States should have available sufficient funds to cover expenses for one full year before attempting to enter a college or university. The cost at this University for one academic year (September-May) is at a minimum approximately $6,000. This estimate includes room and board, tuition, books, clothes, and incidental expenses; no travel, holiday, or medical expenses are included.

Prizes

Norman B. Ames Memorial Award.—Established by many friends of Professor Ames and awarded annually to a graduating senior of the School of Engineering and Applied Science who is nominated by his fellow students as having made significant contributions to the students in the School of Engineering and Applied Science and to the School and University.

Deacon Ames Activities Award.—A plaque awarded annually by Gamma Beta Chapter, of Theta Tau Fraternity, to the senior in the School of Engineering and Applied Science with the most outstanding record in activities for the entire period of attendance.

Martin Mahler Prize in Materials Testing.—A one-year membership in the American Society for Testing Materials awarded to the upper division or graduate student in engineering who submits the best reports on tests in the materials laboratories course with preference given to prestressed concrete tests.

Alfred Martin Freudenthal Distinguished Scholar Award.—Established as a memorial to Professor Freudenthal by his wife, friends, students, and colleagues for his outstanding contributions to engineering education. This honor for academic excellence is awarded annually to the senior who graduates with the highest scholastic standing. The student will receive a cash award, and his/her name will be engraved on a plaque displayed in Tompkins Hall.

Regulations

A STUDENT ENROLLED in the School of Engineering and Applied Science is required to conform to the following regulations.

A student who withdraws or is suspended, or who, for any other reason, is not registered at the University for one semester or more, may re-enter and continue work only under the regulations and requirements in force at the time of return.

If a student knowingly makes a false statement or conceals material information on an application for admission, registration card, or any other University document, the student's registration may be canceled. If such falsification is discovered after the student has established an academic record at the University, the student may be subject to dismissal from the University. Such a student will be ineligible (except by special action of the Faculty) for subsequent registration in the University.

ACADEMIC DISHONESTY

The University community, in order to fulfill its purposes, must establish and maintain guidelines of academic behavior. All members of the community are expected to exhibit honesty and competence in their academic work. Incoming students have a special responsibility to acquaint themselves with, and make use of, all proper procedures for doing research, writing papers, and taking examinations.

Members of the community will be presumed to be familiar with the proper academic procedures and held responsible for applying them. Deliberate failure to act in accordance with such procedures will be considered academic dishonesty. Acts of academic dishonesty are a legal, moral, and intellectual offense against the community and will be prosecuted through the proper University channels.

Copies of the University policy on academic dishonesty can be obtained from the following officers: all department chairmen, all academic deans, and the Vice President for Academic Affairs.

STUDENT CONDUCT

All students upon enrolling and while attending The George Washington University are subject to the provisions of the *Statement of Student Rights and Responsibilities* which outlines student freedoms and responsibilities of conduct, the Judicial System for Non-Academic Student Discipline, and other policies and regulations as adopted and promulgated by appropriate University authorities. Copies of these documents may be obtained at the Office of the Vice President for Student Affairs. Sanctions for violation of these regulations may include permanent expulsion from the University which may make enrollment in another college or university difficult. Regulations or requirements applicable only to a particular program, facility or class of students may not be published generally, but such regulations or requirements shall be published in a manner reasonably calculated to inform affected students.

CHANGES IN PROGRAM OF STUDY

A student may not make any changes in approved program of study without the approval of the Associate Dean. Requests for change in class registration must be made on a form provided in the School office.

During the seven days following the first day of classes of a semester, courses may be added to the student's program with the approval of the instructor, the faculty adviser, and the Associate Dean.

WITHDRAWAL

A student who withdraws or is otherwise absent from the University for one semester or more must apply for readmission. If readmitted, the student continues work under the requirements and regulations in force at the time of readmission.

Applications for withdrawal from the University or for change in class schedule must be made in person or in writing to the individuals indicated below. Notification to an instructor is not an acceptable notice.

Regular Withdrawal

Courses may be dropped by undergraduate and graduate students without academic penalty only during the 28 days following the first day of classes, with the approval of the instructor, the student's adviser, and the Associate Dean.

Late Withdrawal

Withdrawal from any course without academic penalty after the 28th day following the first day of classes of a semester may be granted with the approval of the instructor, the student's adviser, the chairman of the department in which the student is enrolled, and the Associate Dean. Requests for late withdrawal must be submitted to the Associate Dean's office on the appropriate form and must be accompanied by a drop-add slip. Late withdrawals may be granted only under the following conditions:

1. The request is made necessary by exceptional circumstances such as certified medical absence or forced absence caused by work-related requirements, and

2. As of the date of the request, the grades in all courses involved are *C* or better for graduate students, and *D* or better for undergraduate students.

In all cases, financial regulations governing withdrawal remain in full effect.

Change in Course Status

The status of a course may not be changed from credit to audit or vice-versa after the 28th day after classes have started for the semester.

Full tuition is charged for courses dropped without the approval of the Associate Dean. Such unauthorized withdrawal will result in the recording of a failing grade for the course or courses. Permission to withdraw from the University will not be granted to a student who does not have a clear financial record.

CREDIT

Credit is given only after registration for a course and satisfactory completion of the required work, or upon the granting of advanced standing.

Auditing—A person who has been admitted to the University may be registered, with the permission of the instructor, as an auditor in a class (no academic credit). An auditor is not required to take active part or to pass examinations. A student who takes a course as an auditor may not repeat it later for credit.

Balance Sheet.—On request the Registrar will issue to undergraduate degree candidates a balance sheet showing the amount of work completed and the requirements remaining to be met for the degree. A second balance sheet is issued only if the student changes major or degree objectives.

Post-admission Transfer Credit

A student who plans to attend another institution and apply credit so earned toward graduation from this University must first secure the written approval of the adviser, the department chairman, and the Associate Dean, on a form available in room 103, Tompkins Hall. In no event will credit in excess of what might be earned in a similar period in this University be recognized.

TRANSCRIPTS OF RECORD

Official transcripts of student records are issued on written request of the student or former student who has paid all charges, including any student loan installments, due the University at the time of the request. A fee of $2 is charged for each transcript. When more than two transcripts are ordered at the same time, a $2 fee is charged for each of the first two transcripts and a $.50 fee is charged for each additional transcript. Partial transcripts are not issued.

GRADUATION REQUIREMENTS

To be recommended by the faculty for graduation a student must have met the admission requirements of the School; completed satisfactorily the scholarship, curriculum, residence, and other requirements for the degree for which the student is registered; and be free from all indebtedness to the University. Registration is required for the semester or summer session at the close of which the degree is to be conferred.

Application for Graduation.—An "Application for Graduation" form must be filed and the appropriate fee paid at the time of registration for the last semester or summer session of the senior or final year. Students completing degree requirements during the Summer Sessions will be awarded diplomas (no formal convocation) dated September 30, *provided* they have completed all degree requirements and have applied for graduation as a part of registration for the Summer Sessions.

Attendance and Conduct.—The University reserves the right to refuse to confer a degree upon a candidate whose attendance or conduct has been unsatisfactory.

Student Records.—Information on the status of credit, transfer-of-credit awards, balance sheets, and other information relating to graduation may be obtained in room 103, Tompkins Hall.

Area of Concentration Certificate.—Upon successful completion of the Master's degree the student, by means of a written request to the appropriate department chairman, may obtain a certificate indicating the area of concentration.

THE LIBRARY

All students registered in the University have the privilege of using the University Library. Its stacks are open, and all students are welcome to browse. A card denoting approved enrollment for the current semester must be presented when books are borrowed for outside use.

The loan period for stack books is 14 days. A fine of 25 cents is charged for each day a book is overdue. Any book which circulates is subject to recall by the Library if needed for reserve or other use. Reserve books must be used in the reserve reading room when the Library is open, except that they may be withdrawn for overnight use beginning at 8:30 p.m. A fine of 50 cents is charged for each hour or fraction thereof that a reserve book is overdue. Grades of a student are withheld until the library record is clear.

All students using the University Library are expected to be familiar with its detailed regulations, available at any of the Library's service desks.

UNIVERSITY POLICY ON THE RELEASE OF STUDENT INFORMATION

The Family Educational Rights and Privacy Act of 1974 applies to institutional policies governing access to and release of student education records maintained by educational institutions which are recipients of federal funds. The University complies with this statute, which states, in part, that such institutions must:

1. Afford students access to education records directly related to them;
2. Offer students an opportunity for a hearing to challenge such records as inaccurate, misleading, or otherwise inappropriate;
3. Receive the student's written consent before releasing information from his or her education records to persons outside the University, except as provided by the Act and except for directory information as indicated

below. Information may be furnished to a student's parents without such written consent only upon certification of the student's financial dependency; and

4. Comply with a judicial order or a lawfully issued subpoena to release a student's record, notifying the student of such action.

The University will release the following directory information upon request: name, local address; telephone number; name and address of next of kin; dates of attendance; school, college, or division of enrollment; field of study; credit hours earned; degrees earned; honors received; participation in organizations and activities chartered or otherwise established by the University (including intercollegiate athletics); and height and weight of members of athletic teams. A student who does not wish such directory information released must file written notice to this effect in the Office of the Registrar.

Copies of the University's full policy statement on the release of student information may be obtained from the Office of the Registrar.

RIGHT TO DISMISS STUDENTS

The right is reserved by the University to dismiss or exclude any student from the University, or from any class or classes, whenever, in the interest of the student or the University, the University Administration deems it advisable.

RIGHT TO CHANGE RULES

The University and its various colleges, schools, and divisions reserve the right to modify or change requirements, rules, and fees. Such regulations shall go into force whenever the proper authorities may determine.

RIGHT TO MAKE CHANGES IN PROGRAMS

The right is reserved by the University to make changes in programs without notice whenever circumstances warrant such changes.

PROPERTY RESPONSIBILITY

The University is not responsible for the loss of personal property. A "Lost and Found" Office is located on campus in the Safety and Security Office.

UNIVERSITY POLICY ON DRUGS

The University cannot condone violations of law, including violations of those laws which proscribe possession, use, sale, or distribution of drugs. Members of the academic community should know that administrative action, which may

include dismissal from the residence halls, revocation of other privileges, or suspension or dismissal from the University, may be taken in order to protect the interests of the University and the rights of others.

Consortium of Universities of the Washington Metropolitan Area, Inc.

THE UNIVERSITIES IN WASHINGTON, D.C.—American University, Catholic University of America, *George Washington University*, Georgetown University, Howard University, and the University of the District of Columbia—are associated in a Consortium through which they coordinate the use of their respective facilities; Gallaudet College, Mount Vernon College, and Trinity College are associate members of the Consortium. Students in approved programs leading to degrees in any one of these institutions have the opportunity to select from the combined offerings of all the particular courses which best meet their needs.

Participation is limited to campus degree candidates. The following, however, are excluded: students in Canon Law, Dentistry, Medicine, and Theology. Law students are also excluded from participation, except for candidates for the degree of Master of Laws at George Washington University and Georgetown University.

In special courses involving private instruction (as in music or art) or tutorial study, if a special fee is charged, this fee is not covered by the Consortium agreement and must be paid by the individual student to the institution administering the course.

Students are encouraged to study the announcements of programs of all the participating institutions. See pages 197–98 for more information concerning registration for Consortium courses.

Registration forms and instructions are available from the registrar and in room 103, Tompkins Hall. Students register and pay tuition at their own institutions for Consortium courses; course fees are payable to the visited institutions.

Center for Academic and Administrative Computing

THE CENTER FOR ACADEMIC AND ADMINISTRATIVE COMPUTING is located on the third floor of Lisner Hall, 2023 G St., N.W. The computer and other operational supportive services are located on the first floor of Stuart Hall, 2013 G St., N.W. These facilities normally are available 24 hours a day, seven days a week, to all qualified faculty, staff, and students.

The Center provides computational facilities, conducts seminars, consults with users, and provides operational assistance as required. The Center operates an IBM 370/148 (OS VS1) central processing unit and a PDP 11 minicomputer which provides terminal and card remote-job-entry to the 370/148. There is a full range of compilers and application software packages.

Computer programming courses are offered by the School of Government and Business Administration, the Department of Statistics, and the School of Engineering and Applied Science. In addition, many other departments offer courses that utilize the computer as a research adjunct to course work.

The Speech and Hearing Clinic

THE SPEECH AND HEARING CLINIC offers diagnostic and remedial work for children and adults with such communication difficulties as stuttering, lisping, cleft-palate speech, and cerebral-palsied speech; and with voice, articulatory, and hearing problems. Diagnostic and remedial work is also available for persons with nonstandard language usage due to such conditions as hearing loss, brain damage, mental retardation, and environmental factors.

Fees—For full-time George Washington University students the fee for an initial evaluation is $17.50 and for individual speech and hearing therapy, up to $10 per session. Fees for additional specialized testing are dependent on the testing involved. Others should contact the Clinic regarding the fee schedule. Fees are payable at the Clinic.

The Reading Center

THE READING CENTER offers individual diagnostic and corrective services for all levels: primary, elementary, secondary, and adult. In addition, special reading improvement classes are conducted for high school and college students as well as other adults.

A complete diagnosis includes psychological tests; vision, hearing, dominance, and spelling tests; and various types of reading achievement and aptitude tests. Results are interpreted, and a written report is presented in conference with the parents or the individual.

The special reading improvement classes for high school students, college students, and other adults are offered throughout the year at stated intervals. Emphasis is placed on improvement of vocabulary, speed, comprehension, and study skills. Instruction in spelling is also provided as needed. Mechanical aids such as the tachistoscope, rate accelerator, and controlled reader are available for increasing speed of comprehension.

Fees.—The fee for full-time George Washington University students and alumni for reading classes (15 two-hour sessions) is $90. Others should contact the Center regarding the fee schedule. All fees are payable in advance at the Reading Center.

Reading instruction is required for first-year undergraduate students with insufficient reading skills who are taking English 9.

Veterans Benefits

THE VETERANS COUNSELOR'S office, located on the fifth floor of Rice Hall, 2121 Eye St., N.W., assists students entitled to educational benefits as veterans or as widows or children of deceased or totally disabled veterans with any prob-

lems which may arise concerning their benefits. This Office also processes certification of enrollment and attendance to the Veterans Administration so that educational allowances will be paid.

When feasible, students entitled to benefits as veterans or dependents of veterans should consult with the veterans counselor prior to submitting application to the Veterans Administration. All such students should obtain the instruction sheet issued by the veterans counselor which sets forth requirements to be fulfilled before certification of enrollment can be made to the Veterans Administration and which includes other information of general interest.

The Veterans Administration is at 941 N. Capitol St., N.E., Washington, D.C. 20421.

ROTC

GEORGE WASHINGTON UNIVERSITY students may enroll in the Army ROTC program offered at Georgetown University, the AFROTC program at the University of Maryland, or the Army ROTC or AFROTC at Howard University. Those interested should contact the ROTC enrollment officer at one of these universities. Credit for such courses may be transferable to George Washington University; prior approval is required by the dean of the school in which the student is enrolled.

Alumni Associations

THE GENERAL ALUMNI ASSOCIATION

THE OBJECTIVES OF THIS ASSOCIATION are to unite the graduates who wish to associate themselves for charitable, educational, literary, and scientific purposes, and to promote the general welfare of the University.

Eligible members are those who have enrolled in any school of the University and who have left the University in good standing, or any person who is or has been a member of the teaching, research, or administrative staff of the University, or of the Board of Trustees of the University. Active members are those who are life members of the George Washington University General Alumni Association or the Alumni Association of any school of the University, or are current contributors to the George Washington University Fund.

All alumni are urged to keep the Alumni Office informed of changes of address or occupation and to supply information with regard to their fellow alumni. The Office is located in Alumni House, 714 21st St., N.W., George Washington University, Washington, D.C. 20052.

THE ENGINEER ALUMNI ASSOCIATION OF THE GEORGE WASHINGTON UNIVERSITY, INC.

The Engineer Alumni Association was organized in 1936 and incorporated in 1963 to coordinate with the General Alumni Association those activities of primary interest to the engineering alumnus. The objectives of the Association are to provide the link between the graduates and faculty of the School, to help promote the general welfare of the School of Engineering and Applied Science and of the University, to foster activities of the engineering organizations recognized by the University, and to advance the engineering profession in general.

In 1966 a board of directors, comprised of 15 elected members of the Association and the Engineers' representatives serving on the Governing Board of the General Alumni Association, was established. The membership of the board of directors was expanded in 1969 to include the Director of Alumni Relations and one representative each from the faculty of the School and the student body. Members of the Association are elected each year, prior to the June meeting, to three-year board memberships as listed below:

Term Expiring 1979	*Term Expiring 1980*	*Term Expiring 1981*
Wesley G. Harris	Habib Duranni	John V. Howie
Norris C. Hekimian	Pastor Farinas	John A. LeReche
John P. Storms	Richard J. Pronk	Eric S. Mendelsohn
Stuart F. Terrett III	Harold Sangester	Dudley J. Schwartz
John M. Wehrung	Herbert S. Wilkinson	James A. Sinsabaugh

General Alumni Association Representatives
Douglas L. Jones
John R. Manning
Issa Khozeimeh

Student Representative
Andrew Kremer

Faculty Representative
Galip M. Arkilic

Regional Director
William H. Holt

At the June meeting each year the board elects officers for its operation during the upcoming year. The officers for the year 1978–79 are

President.—Richard J. Pronk, B.S. in Engr. 1958; 12702 Bermuda Lane, Bowie, Md. 20715

Vice President.—James Sinsabaugh, B.M.E. 1949; 1101 Oakcrest Rd. S., Arlington, Va. 22202.

Secretary.—Pastor Farinas, M.E.A. 1972; 5 Bethayres Ct., Rockville, Md 20855

Treasurer.—Eric S. Mendelsohn, B.S.C.E. 1967; 7728 Warbler Lane, Derwood, Md. 20855

STUDENT LIFE

THE OFFICE OF THE VICE PRESIDENT FOR STUDENT AFFAIRS develops student life services, policies, and procedures to complement the University's formal instruction program. These activities are implemented through the offices of

the Cloyd Heck Marvin Center, Counseling Center, Dean of Students, Educational Opportunity Program, Housing, International Students, Student Activities, Student and Alumni Career Services, and Student Health Service.

Student Services

OFFICE OF THE DEAN OF STUDENTS

The Office of the Dean of Students provides counseling and information for students and assists in program development for the Division of Student Affairs. Staff members are well-informed on University policies and the various student services provided on campus, enabling them to provide referrals and answers to many questions concerning general student life. Personal letters of recommendation for students applying to graduate and professional schools can be obtained from this office. The Dean of Students works with the Adviser to International Students, the Director of the Counseling Center, the Director of the Educational Opportunity Program, the Director of the Student Health Service; and the Director of the Student and Alumni Career Services Office in the implementation of their programs.

SERVICES FOR STUDENTS WITH DISABILITIES

The Director of Services for Students With Disabilities works to assure that the special services necessary for handicapped students to participate fully in their academic programs and the extra-curricular life of the campus are provided for them through university or community resources.

HOUSING

Complete information concerning the University's residence halls is available from the Director of Housing, George Washington University, Washington, D.C. 20052. Information concerning off-campus housing near the University may be obtained at this Office.

Admission to the University does not include a room reservation. The student will receive, with his notification of acceptance, University residence hall information, an application for residence hall space, and a declaration of intent to attend the University. The application for residence hall space must be accompanied by a $100 *nonrefundable deposit*. The housing deposit is credited toward the first semester's room charge. Rooms are leased for the academic year, and lease payment must be made by June 15 for the fall semester.

1979–80 Residence Hall Rates Per Person For Two Semesters*

For Men:
Calhoun Hall
double room $1,300
triple room 1,240

*Residence Hall prices and allocation and food service prices subject to change.

For Women:

Strong Hall
- single room $1,3
- double room 1,3
- triple room 1,2

For Men and Women:

Crawford Hall (limited to sophomores, juniors, and seniors)—
- double room 1,3

Building JJ, Creative Arts (limited to sophomores, juniors and seniors)—
- apartments for 4 or 6 persons 1,3

Francis Scott Key Hall (limited to juniors and seniors):
- apartment for two persons 1,3
- apartment for three persons ..... 1,386 or 1,3

Mitchell Hall (limited to sophomores, juniors, and seniors)—
- single room 1,3

Madison Hall
- double room 1,3
- triple room 1,2

Thurston Hall
- double room, triple room, room for four 1,3
- suite for six, small room for four 1,2

Food Service

Resident freshmen and sophomores are required to participate in the food service plan. Freshmen must participate in the seven-day, 19 meals per week plan at the rate of $932* for the academic year. Sophomores may elect either the 19-meal plan or an "any 14 meals" per week plan for $876* for the academic year. Each plan, plus an additional "any 10 meals" per week plan at $756* for the academic year, is optional for junior, senior, and graduate students. Food service payment does not cover University intersession or vacation periods. All meal cards admit bearer to dining rooms in Thurston and Mitchell Halls and the second floor contract dining room in the Cloyd Heck Marvin Center. Meal cards may also be used on a cash equivalency basis in the Marvin Center first floor cafeteria and Rathskeller.

Students who observe the Jewish dietary laws can write to make arrangements with the George Washington University Housing Office regarding the B'nai B'rith Hillel Foundation Kosher Meal Plan.

Munson Hall Apartments

Munson Hall is a University owned and operated apartment house containing 15 one-bedroom and 54 efficiency apartments. Full-time graduate and married students are eligible to reside in Munson Hall. Those wishing to apply for an apartment should contact the Housing Office for a waiting list application. All leases are for 12 months.

* Residence Hall prices and allocation and food service prices subject to change

Milton and Guthridge Apartments

These apartment houses are University-owned, commercially operated buildings within the campus area. Each building contains efficiency and one-bedroom units which are rented only to full-time graduate students on an "as available" basis. Referrals to the resident managers of these buildings are made by the Director of Housing when notice is received of vacancies. Leases are executed with the respective management companies and are on a month-to-month basis.

EDUCATIONAL OPPORTUNITY PROGRAM

The Educational Opportunity Program is designed to provide selected District of Columbia high school graduates and other qualified District residents with financial and personal support as well as academic assistance to help students pursue degree work at George Washington University. The Program office is located at 2127 G Street, N.W.

CLOYD HECK MARVIN CENTER

The Cloyd Heck Marvin Center serves as the campus community center, providing services, conveniences, and recreational and social opportunities for students, faculty, staff, alumni, and guests. Its wide range of facilities provides the setting for a variety of programs conducted by the University Program Board; by the departments of drama, dance, and music; and by other student and faculty organizations.

The Center Governing Board, representative of all segments of the University community, plays an important role in the day-to-day functioning of the Center. This Board works closely with the full-time staff in the development of procedures and policies which provide a framework for the Center's operation.

STUDENT HEALTH SERVICE

The Student Health Service is an outpatient clinic located at 935 22nd St., N.W. (in the H.B. Burns Memorial Building).

Physicians and physician assistants are available by appointment from 9 a.m. to 4:45 p.m., Monday through Friday. In addition, physician assistants are available for primary care to walk-in patients Monday through Friday from 5 to 8:45 p.m., on Saturday from 9 a.m. to 12 noon, and on Sunday from 10 a.m. to 12 noon.

For serious emergencies occurring during hours when the Student Health Service is closed, students may go to the Emergency Room of the University Hospital for treatment. This arrangement is for emergency care only, and all fees are the responsibility of the student.

Students must be currently enrolled on campus in the University to receive treatment at the Student Health Service. Students who so desire may engage physicians and nurses of their own choice, but such students will be responsible for all the fees charged. The bills incurred from all services rendered outside of the Student Health Service (for example, X-ray work, laboratory work, and referrals to specialists or other outside physicians) are the responsibility of the student.

Health and Accident Insurance

The Student Health Service has arranged for and endorsed group health and accident insurance, on an elective basis, for those students who do not have other coverage. Interested students should consult the Student Health Service office.

COUNSELING CENTER

The Counseling Center works to enable students to overcome obstacles which hamper learning. The Center's services are offered to students and staff, and include (1) resolution of the individual's educational, vocational, or personal conflicts through short-term individual or group counseling, vocational testing, or study skills remediation; (2) training of graduate students, resident assistants, and paraprofessionals; (3) consulting on mental health topics; and (4) development of new methods and programs to aid student growth, such as counseling through written communication, videotaped counselor skills training, and interpersonal skills workshops.

The Center administers the Miller Analogies Test, admissions testing, and special assessments for business and industry. Through its Office of Community Services, the Counseling Center also provides vocational counseling and educational programs to the greater Washington community.

Students may request a cost-free interview from 9 a.m. to 4:30 p.m., Monday through Thursday, and 1 to 4:30 p.m. on Fridays. If the student decides to continue, a fee of $5 for full-time students ($15 for part-time students) per appointment will be charged for short-term treatment. If a test battery is called for, an additional $12 materials fee will be charged. However, if financial need is a factor, fee adjustments can be made.

The Counseling Center is located at 718 21st St., N.W.

INTERNATIONAL STUDENT ADVISING OFFICE

Located in the International House at 2129 G St., N.W., the staff of the International Student Advising Office provides advising and counseling in matters of personal and academic concern and visa regulations. This office is also a consultation, information, and resource center for the University's international population.

STUDENT AND ALUMNI CAREER SERVICES OFFICE

The Career Services Office provides career guidance and placement to GW students and alumni. Some of the specific services are: full-time and part-time job vacancy lists, career counseling, programs on job-seeking skills, a full library of literature on occupations and employers, and current information on government employment, including testing dates and application forms. Seniors and alumni may also use the office to establish credential files for application to graduate schools and for employment. The office is open from 9 a.m. to 5 p.m. Monday through Friday, with evening hours scheduled during each semester. It is located at Woodhull House, 2033 G St., N.W.

RELIGIOUS LIFE

The University recognizes the contribution that religion makes to the life of its students and encourages them to participate in the various religious organizations of their own choice. Catholic, Jewish, and Protestant bodies sponsor various groups and form a link between the University and the religious community. The advisers of the religious organizations are available for counseling.

Religious services in various traditions are provided regularly for the University community as announced.

DAVIS-HODGKINS HOUSE

The Davis-Hodgkins House is the student center of the School of Engineering and Applied Science, providing lounges, reading rooms, and student organization offices. The House provides convenient, comfortable facilities for the exchange of ideas and good fellowship.

Student Activities

The offices of the Vice President for Student Affairs, the Dean of Students, the Director of the Cloyd Heck Marvin Center, and the Director of Student Activities are responsible for all co-curricular phases of student life.

STUDENT ACTIVITIES OFFICE

The Student Activities Office assists individual students and organizations in program development, campus leadership training, and participation in special projects, both within the University community and the community at large. The office serves as a clearinghouse for activities information, registers and advises student organizations, and informs the University community of activities and programs through a variety of weekly, monthly and annual publications. The Student Activities Office is also responsible for coordinating the orientation program for new students. Students who want to participate in the extracurricular phases of University life should acquaint themselves with the facilities and staff of the Student Activities Office.

UNIVERSITY COMMITTEES AND ORGANIZATIONS

Student involvement is a motivating force in the governance of the University through the committee structure. This involvement has helped develop policies and programs beneficial to the student population and to the total University community. The numerous committees on which students may serve are described in the *Student Handbook*, which is available in the Student Activities Office.

Student Government

The George Washington University Student Association (GWUSA) is comprised of all full-time and part-time graduate, professional, and undergraduate students who are registered for academic credit on campus. A body of elected and appointed individuals is responsible for representing the interests of students at the University. Further information can be obtained from the Student Government offices in the Marvin Center.

THE ENGINEERS' COUNCIL

The Engineers' Council is the student governing body for the School of Engineering and Applied Science, composed of elected representatives from each level class and from the graduate student body, from each student organization in the School, and the House Manager of the Davis-Hodgkins House. The purpose of the Council is to provide liaison between the student body of the School and the Faculty, Administration, and Student Government of the University in all matters affecting the general interests and welfare of the student body, the School, or the University. The Council is maintained financially by the Engineers' Council fee paid by each student in the School, and sponsors the Engineers' Mixers and the Engineers' Ball. Council meetings are open to all students in the School.

STUDENT ORGANIZATIONS

Students are encouraged to become involved with existing student organizations or to initiate their own. The *Student Handbook*, available in the Student Activities Office, lists approximately 150 organizations under the following categories: Academic; Professional; Honorary; International; Cultural; Political Interest; Service; Special Interest; Sports, Hobbies and Recreation; Religious and Mediative; and Social Fraternities and Sororities. More complete information about these organizations can be obtained through the Student Activities Office.

The following is a representative list of organizations active at the University during 1979–80 of particular interest to students in the School of Engineering and Applied Science. More complete information on these and other organizations is available at the Student Activities Office.

Honor Societies

Sigma Xi.—A national scientific honor society, the purpose of which is to encourage original investigation in science, pure and applied. Outstanding graduate students in the sciences are eligible for full membership, and undergraduates who have shown marked ability in research may be elected to associate membership.

Delta Sigma Rho-Tau Kappa Alpha.—A national forensic society.

Mortar Board.—A national society for juniors and seniors, stressing leadership, scholarship, and service.

Omicron Delta Kappa.—A national society emphasizing leadership in extra-curricular activities.

Phi Eta Sigma.—A national society established to encourage and reward high scholarship and attainment, membership in which is limited to those freshmen who attain a scholastic average of at least 3.50 or the equivalent.

Tau Beta Pi.—A national engineering honorary fraternity, the purpose of which is to recognize distinguished scholarship and exemplary character.

Eta Kappa Nu.—A national electrical engineering honor society established to recognize scholarship, character, and service.

International and Cultural Exchange Organizations

East Asian Society, Friends of Canada, International Students' Society, Latin American Association, Libyan Student Organization, Organization of Arab Students, Polish American Youth Club, Students' Cultural Association of India, World Affairs Society.

Performing Arts

GWU Dance Production Groups; Student Productions; University Chamber Choir, Chorus, Orchestra; University Program Board; University Theater. A variety of programs is presented by these groups throughout the academic year.

Political Interest Organizations

GW Ripon Society, GW College Young Republicans, GW Young Democrats, Young Americans for Freedom, Young Socialist Alliance.

Professional Organizations

American Society of Civil Engineers (Student Chapter).

American Society of Mechanical Engineers (Student Chapter).

Institute of Electrical and Electronic Engineers (Student Chapter).

Theta Tau (Gamma Beta Chapter).—A national professional (engineering) fraternity. Membership by invitation to outstanding students who have completed successfully at least the first year in the School of Engineering and Applied Science.

Publications and Communications

The Cherry Tree (yearbook), *G.W. Forum* (student-faculty journal), *Potomac Review* (publication of Consortium graduate students), *The Rock Creek* (literary magazine), *Student Handbook, This Month* (listing of major cultural events in the Washington area), *Campus Calendar* (biweekly listing of scheduled events), *The University Hatchet* (semi-weekly newspaper), WRGW (University radio station), 676-NEWS (recorded telephone message of daily University activities).

Religious and Meditative Organizations

Baptist Student Union, B'nai B'rith Hillel Foundation, Christian Science Organization, Eastern Orthodox Fellowship, Eckankar Campus Society, Inter-

Varsity Christian Fellowship, Lutheran Student Association, Newman Foundation, Psychegenics Club, Religious Society of Friends, Student International Meditation Society, Unitarian-Universalist Club, United Christian Fellowship, Wesley Foundation.

Service Organizations

Circle K, Ecology Action, GW Medical Aid, Project Share, St. Elizabeth's Hospital Project, SERVE, Student Housing Project, Student Volunteer Action Council.

Social Fraternities

Delta Tau Delta, Kappa Sigma, Sigma Alpha Epsilon, Sigma Chi, Sigma Nu, Sigma Phi Epsilon, Tau Kappa Epsilon. The Interfraternity Forum coordinates the interest and concerns of some of the fraternities on campus.

Social Sororities

Delta Gamma, Delta Sigma Theta, Kappa Kappa Gamma, Phi Sigma Sigma. A Panhellenic Council includes representatives of sorority chapters at the University.

Special Interest and Advocate Groups

Black Peoples' Union, Jewish Activist Front, Legal Aid Bureau, Peoples' Union, D.C. Public Interest Research Group (GW Chapter), Student Recruitment Committee.

Sports, Hobbies, Recreational Organizations

Amateur Radio Club, Cheerleaders, Collegiate Bowling Club, Folkdance Club, Hockey Club, Military Collectors, Philubious Eggworte (music).

ATHLETICS AND INTRAMURAL SPORTS

The University is a member of the National Collegiate Athletic Association, the Eastern College Athletic Conference, the Association for Intercollegiate Athletics for Women, and the Eastern Association of Intercollegiate Athletics for Women. Its teams participate against major universities throughout the Midwest and Eastern Seaboard. The intercollegiate programs for men and women offer such sports as basketball, baseball, soccer, tennis, golf, wrestling, crew, swimming and diving, squash, badminton, volleyball, and gymnastics.

The University offers a broad program of intramural sports activities for both men and women.

MAJOR PROGRAM EVENTS

Art Exhibits.—The work of locally, nationally, and internationally known artists is shown in monthly exhibits in the Dimock Gallery in Lisner Auditorium and in the art gallery of the Cloyd Heck Marvin Center. With the cooperation of the Curator of Art, an annual student art exhibit is presented

Concert Series.—The Department of Music presents a series of concerts featuring faculty, guest, and student artists throughout each year.

Dance.—The GWU Dance Company presents major concerts, informal studio performances, experimental events, television appearances, and lecture-demonstrations. Students may audition to become company members and have the opportunity to choreograph, perform, and gain experience in the technical aspects of dance productions.

International Programs.—The International Student Society presents an annual International Dinner in cooperation with foreign embassies and international restaurants. Other programs include regular forums and speakers on international topics.

Orchestra and Chorus Concert Series.—The University Orchestra and Chorus are two facets of the lively arts available to students either as credit courses or as extracurricular activities. The Chorus presents major performances to the University community three or four times a year, including regular winter and spring concerts. The University Orchestra presents several performances annually.

Program Board Series.—The University Program Board regularly sponsors social activities, films, lectures, and special events.

Recreation Program.—The new Charles E. Smith Center for Physical Education and Athletics offers many facilities for student use. The University Recreation Association and the Department of Human Kinetics and Leisure Studies arrange a wide variety of sports and recreational activities and special events for all students.

Theater.—The University Theater produces four or five major plays and musicals during the year on the new proscenium/thrust stage in the Dorothy Betts Marvin Theatre or in Lisner Auditorium. Additional works, including original and experimental plays, are produced in a more intimate studio theater. Students have the opportunity to participate in all aspects of theater and may receive credit toward their B.A. or M.F.A. degrees for some of their production work.

THE UNIVERSITY

History and Organization

THE GEORGE WASHINGTON UNIVERSITY had its beginning in 1821 as The Colum bian College in the District of Columbia. The name of the institution w changed in 1873 to Columbian University and in 1904 to The George Wash ington University. The debt of the University to George Washington, whos name it bears, is large but intangible.

George Washington, as President and as private citizen, had urgently insiste upon the establishment of a National University in the Federal City. There hoped that, while being instructed in the arts and sciences, students from parts of the country would acquire the habits of good citizenship, throwing local prejudices and gaining at first hand a knowledge of the practice, as w as the theory, of republican government. To further the materialization of h hopes, Washington left a bequest of fifty shares of The Potomac Compan "towards the endowment of a University to be established within the limits the District of Columbia, under the auspices of the General Government, that government should incline to extend a fostering hand towards it." Congress never extended "a fostering hand." The Potomac Company passe out of existence, and Washington's bequest became worthless.

Fully conscious of Washington's hopes, but motivated primarily by a gre missionary urge and the need for a learned clergy, a group of dedicated min isters and laymen sponsored a movement for the establishment of a college the District of Columbia. Inspired largely by the zeal and energy of the Re erend Luther Rice, they raised funds for the purchase of a site and petitione Congress for a charter. After much delay and amendment, Congress grante a charter which was approved by President Monroe on February 9, 1821. T safeguard the College's nonsectarian character it provided "that persons every religious denomination shall be capable of being elected Trustees; no shall any person, either as President, Professor, Tutor or pupil, be refused admittance into said College, or denied any of the privileges, immunities, o advantages thereof, for or on account of his sentiments in matters of religion."

During the entire time when the institution was known as Columbian College its activities were centered on College Hill, a tract of forty-six and a half acre between the present Fourteenth and Fifteenth Streets and extending north from Florida Avenue to somewhat beyond Columbia Road. The Medical Scho

was located downtown. For the better part of the Columbian University period, the buildings of the University were situated along H Street between Thirteenth and Fifteenth Streets.

During the last half century the University's present plant has been developed in that section of the old First Ward familiarly known as "Foggy Bottom," between Nineteenth and Twenty-fourth Streets, south of Pennsylvania Avenue. The area is not without its reminders of historic interest to the University. President Monroe, who signed the Charter, lived at 2017 Eye Street; the first President of the Board of Trustees, the Reverend Obadiah B. Brown, was for 50 years the pastor of a church at Nineteenth and Eye Streets, and Washington had selected Twenty-third and E Streets as the site of the National University he hoped to see established.

The University as it is now organized consists of Columbian College of Arts and Sciences (undergraduate); the Graduate School of Arts and Sciences; the professional schools, which include the National Law Center and the schools of Medicine and Health Sciences, Engineering and Applied Science, Education and Human Development, Government and Business Administration, and Public and International Affairs; the College of General Studies; the Division of University Students; the Division of Experimental Programs; and the Summer Sessions.

The George Washington University is privately endowed and is governed by a Board of Trustees of which the president is an *ex officio* member.

The University Libraries

The library collections of the University are housed in the University Library (the general library of the University) and in the libraries of the Institute for Sino-Soviet Studies, the National Law Center, and the School of Medicine and Health Sciences.

These collections contain approximately 787,000 volumes, to which are added some 40,000 volumes a year. Endowments supplementing the University appropriation provide books in the fields of American civilization, American literature, foreign service, history, public finance, and the social sciences, and gifts from many sources have enriched the collections. The Libraries currently receive 8,000 serials.

Information concerning the use of the libraries may be obtained at the library service desks.

The library is administered for the curricular, reference, and recreational needs and interests of the students. Instruction in the use of the library is given by the reference librarians upon request. The library endeavors to assist students and all members of the University to use the rich library resources of Washington and the unusual opportunities they offer for extensive research. Interlibrary loan arrangements are maintained with other libraries in the city and throughout the United States.

The student has access to the Library of Congress, the Public Library of the District of Columbia and its branches, and many of the special collections of the government departments. Graduate students at George Washington University may, upon application, be issued a Consortium library card which permits direct borrowing from the libraries of the other Consortium institutions.

The Board of Trustees of the University

E.K. Morris, LL.D., D.P.S., *Chairman Emeritus*
Charles E. Phillips, LL.B., LL.M., *Chairman Emeritus*

Glen A. Wilkinson, B.S., J.D., *Chairman*
Everett H. Bellows, M.A., *Vice Chairman*
James M. Mitchell, M.A., *Secretary*
Thaddeus A. Lindner, B.A. in Govt., *Assistant Secretary*

George M. Bunker, B.S.
Mortimer M. Caplin, B.S., LL.B., J.S.D., LL.D.
*Lyn Henderson Clark, B.A.
Henry C. Clausen, J.D.
Jacqueline Cochran, L.H.D., LL.D., Sc.D.
Donald C. Cook, B.A., M.B.A., J.D., LL.M., L.H.D., LL.D.
L. Stanley Crane, B.S.
*Joseph B. Danzansky, B.A., J.D.
Nancy B. Dudley, B.A. in Govt.
John B. Duncan, B.A., LL.B., LL.D.
Lloyd H. Elliott, M.A., Ed.D., LL.D., *President of the University, ex officio*
Morton I. Funger, B.A.
Katharine Graham, B.A.
Edwin K. Hoffman, B.S.
Joseph D. Hughes, B.S., J.D., LL.M., LL.D.
L.A. Jennings
David M. Kennedy, LL.B., M.A., LL.D.
Melvin R. Laird, L.H.D., LL.D., D.Pol.S.
*Sidney A. Levine, B.A., M.D.
Franklin J. Lunding, LL.B., LL.D.
Jeremiah Milbank, B.A., M.B.A.
Thornton W. Owen, B.S. in C.E., B.A.
Flaxie M. Pinkett, B.A.
*Abe Pollin, B.A. in Govt.
S. Dillon Ripley II, Ph.D., L.H.D., Sc.D.
Orville F. Rush, J.D., LL.D.
John T. Sapienza, B.A., LL.B.
Carleton D. Smith
Douglas R. Smith, B.S.C.
Robert H. Smith, B.A.
Carleton M. Stewart, M.B.A.
Mark Sullivan, Jr., B.A.
John W. Thompson, Jr., B.A.
Robert L. Tull, B.A.
William G. White, B.S. in C.E.
*Glen A. Wilkinson, B.S., J.D.
Stephen R. Woodzell, B.S. in E.E.
James O. Wright, B.S., J.D.
*Joseph S. Wright, LL.B., LL.D.

* Alumni trustee.

HONORARY TRUSTEES

Jacob Burns, LL.B., LL.D.
George A. Butler, LL.B.
Leon Chatelain, Jr.
Harry F. Duncan
Newell W. Ellison, B.A., LL.B., LL.D.
Melville B. Grosvenor, B.S., Sc.D., LL.D.
Brooks Hays, B.A., J.D., LL.D., L.H.D., D.C.L., D.D., HH.D.
Joseph H. Hirshhorn
E.K. Morris, LL.D., D.P.S.
Godfrey L. Munter, B.A., LL.B., LL.D.
Charles E. Phillips, LL.B., LL.M.
Charles E. Smith
Alexander Wetmore, Ph.D., Sc.D.
John J. Wilson, LL.B., LL.D.
Watson W. Wise, Ph.B., Litt.D.

Officers of Administration

Lloyd Hartman Elliott, M.A., Ed.D., LL.D., *President*
Harold Frederick Bright, Ph.D., *Provost and Vice President for Academic Affairs*
Seymour Alpert, B.A., M.D., *Vice President for Development*
Charles Edward Diehl, B.Arch.Engr., B.C.E., M.B.A., *Vice President and Treasurer*
William David Johnson, B.S., *Director of Planning and Budgeting*
Ronald Paul Kaufman, B.S., M.D., *Vice President for Medical Affairs*
Carl James Lange, Ph.D., *Vice President for Administration and Research*
Louis Harkey Mayo, B.S., J.S.D., *Vice President for Policy Studies and Special Projects*
Frederick Justin Naramore, B.S., C.P.A., *Comptroller*
William Parkhurst Smith, Jr., B.A., M.B.A., M.A. in Ed., *Vice President for Student Affairs*

Robert Gebhardtsbauer, B.A., M.A., *Registrar*
Joseph Young Ruth, B.A., *Director of Admissions*

THE SCHOOL OF ENGINEERING AND APPLIED SCIENCE

Faculty and Staff of Instruction*

EMERITUS

Robert Emmet Cronin, *Professor Emeritus of Engineering and Applied Science*
B.S. 1925, U.S. Naval Academy; M.S. 1932, Columbia University

Benjamin Carpenter Cruickshanks, *Professor Emeritus of Mechanical Engineering*
B.S. in M.E. 1920, George Washington University

Kenneth Johnson, *Professor Emeritus of Engineering Administration*
B.A. 1931, Indiana State University; Ph.D. 1937, Purdue University

Herbert Ernest Smith, *Professor Emeritus of Engineering Administration*
B.S. 1930, C.E. 1932, City University of New York, City College; M.S. 1936, Ph.D. 1940, New York University

Carl Hugo Walther, *Professor Emeritus of Engineering and Applied Science*
B.E. 1931, M.C.E. 1933, Johns Hopkins University; Ph.D. 1967, University of Maryland

ACTIVE

Abd-elfattah Abd-alla, *Professor of Engineering and Applied Science*
B.S. 1960, Ain Shams University, Egypt; M.S. 1963, Alexandria University, Egypt; Ph.D. 1967, University of Maryland

Achilles Grammenos Adamantiades, *Professorial Lecturer in Engineering*
Ph.D. 1966, Massachusetts Institute of Technology

Julian Gordon Adler, *Associate Professorial Lecturer in Engineering*
B.S.E. 1960, University of Michigan

* Professors, Adjunct Professors, Associate Professors, Assistant Professors, and Instructors constitute the Faculty. The President of the University, the Vice President for Academic Affairs, the Registrar of the University, the Director of Admissions of the University, and the University Librarian are ex officio members of the Faculty.

Joseph Morris Aein, *Professorial Lecturer in Engineering*
B.S. in E.E. 1958, Massachusetts Institute of Technology; M.S. in E.E. 1958, Ph.D. 1962, Purdue University

Charles Alexander, Jr., *Associate Professorial Lecturer in Engineering*
B.S. 1962, Lowell Technological Institute; M.S. 1965, University of New Hampshire; Ph.D. 1973, University of Maryland

Richard D. Angelari, *Assistant Professorial Lecturer in Engineering*
B.E.E. 1956, M.E.E. 1963, Polytechnic Institute of New York; Ph.D. 1975, New York University

Maurice Apstein, *Research Professor of Engineering Administration*
B.S. in E.E. 1932, City University of New York, City College; M.E.A. 1960, George Washington University; Ph.D. 1963, American University

Galip Mehmet Arkilic, *Professor of Applied Science*
B.M.E. 1946, Cornell University; M.S. 1947, Illinois Institute of Technology; Ph.D. 1954, Northwestern University

George Axelby, *Assistant Professorial Lecturer in Engineering*
B.S. 1950, University of Connecticut; M.S. 1951, Yale University

Abdul Aziz, *Associate Professorial Lecturer in Engineering*
B.S. in M.E. 1952, Dacca University, Bangladesh; M.S. in M.E. 1954, Michigan State University; Ph.D. 1972, University of Maryland

Gokalp Babaoglu, *Assistant Professorial Lecturer in Engineering*
B.A. 1974, M.S. 1976, George Washington University

Robert Fulton Baker, *Professorial Lecturer in Engineering*
B.C.E. 1940, Ohio State University; M.S. in C.E. 1942, Purdue University

Harold Sidney Balaban, *Assistant Professorial Lecturer in Engineering*
B.B.A. 1955, City University of New York, City College; M.A. 1962, American University; Ph.D. 1978, George Washington University

Stephen John Balut, *Associate Professorial Lecturer in Engineering*
B.A. 1960, King's College; M.S. 1973, Ph.D. 1973, Naval Postgraduate School

Bruce Richard Barkstrom, *Associate Research Professor of Applied Science*
B.S. 1966, University of Illinois; M.S. 1971, Ph.D. 1972, Northwestern University

Richard Walker Barnwell, *Associate Professorial Lecturer in Engineering*
B.S. 1961, M.S. 1962, Auburn University; Ph.D. 1968, Virginia Polytechnic Institute and State University

Zeev Barzily, *Assistant Professor of Operations Research*
B.S. 1968, M.S. 1971, D.Sc. 1974, Technion, Israel Institute of Technology

Nicholas Basdekas, *Professorial Lecturer in Engineering*
B.S. 1954, M.S. 1955, C.E. 1958, Columbia University; Ph.D. 1969, Catholic University of America

William G. Batte, *Professorial Lecturer in Engineering*
E.E. 1950, I.E. 1950, Virginia Polytechnic Institute and State University; Ph.D. 1965, Case Western Reserve University

Harry Lee Beach, Jr., *Assistant Professorial Lecturer in Engineering*
B.S. 1966, M.S. 1968, Ph.D. 1970, North Carolina State University at Raleigh

Ivan Earl Beckwith, *Assistant Professorial Lecturer in Engineering*
B.S. 1948, University of Iowa

John Amos Belding, Jr., *Professorial Lecturer in Engineering*
B.S. 1965, Ph.D. 1969, University of Alabama

Bruce A. Bell *Associate Professor of Engineering*
B.C.E. 1968, M.S.C.E. 1969, Ph.D. 1974, New York University

John William Benoit, *Associate Professorial Lecturer in Engineering*
B.S. 1952, University of Washington; M.S. 1954, North Carolina State University at Raleigh; Ph.D. 1961, Princeton University

Howard Emery Bethel, *Associate Professorial Lecturer in Engineering*
B.S. in Ae.E. 1961, M.S. 1963, Ph.D. 1966, Purdue University

John Joseph Bisaga, *Assistant Professorial Lecturer in Engineering*
B.S. in E.E. 1955, M.S. in E.E. 1963, Drexel University

William Thomas Bisignani, *Associate Professorial Lecturer in Engineering*
B.S. 1961, M.S. 1962, Ph.D. 1972, Rutgers—The State University

Lewis Horrigan Blakey, *Associate Professorial Lecturer in Engineering*
B.S. in C.E. 1954, University of Notre Dame; M.S. 1962, George Washington University

Jerry Wayne Blankenship, *Associate Professorial Lecturer in Engineering*
M.S. 1970, Western Kentucky University; Ph.D. 1974, Northwestern University

Peter Bock, *Special Lecturer in Engineering*
B.A. 1962, Ripon College; M.S. 1964, Purdue University

William James Boettinger, *Assistant Professorial Lecturer in Engineering*
B.E.S. 1968, Ph.D. 1972, Johns Hopkins University

Thomas M. Bottegal, *Assistant Professorial Lecturer in Engineering*
B.S. in E.E. 1972, George Washington University

Roland Lee Bowles, *Assistant Professorial Lecturer in Engineering*
B.S. 1959, Randolph-Macon College; M.S. 1961, Ph.D. 1971, University of Virginia

Daniel Philip Boyd, *Professorial Lecturer in Engineering*
B.S. in Ch.E. 1963, M.S. 1965, Ph.D. 1968, University of Maryland

Edward Howard Braun, *Associate Professor of Engineering and Applied Science*
B.A. 1948, M.A. 1950, Columbia University

Barton Brooke Bright, *Professorial Lecturer in Engineering*
B.A. 1932, American University

Joseph Bertram Bronder, *Assistant Professorial Lecturer in Engineering*
B.S. 1955, University of Dayton; M.A. 1957, Washington University; Ph.D. 1965, University of Arizona

Fred Michael Brosi, Jr., *Assistant Professorial Lecturer in Engineering*
B.S. 1970, Carnegie-Mellon University; M.S. 1975, George Washington University

Ronald Max Brown, *Associate Professorial Lecturer in Engineering*
B.S. 1958, M.S. 1960, M.A. 1964, Ph.D. 1970, Indiana University at Bloomington

Pierpont Blair Buck, *Associate Professorial Lecturer in Engineering*
B.A. 1943, Yale University; Ph.D. 1949, University of Virginia

William Samuel Butcher, *Professorial Lecturer in Engineering*
B.E. 1946, University of Sydney, Australia; M.S. 1961, University of California, Berkeley; Ph.D. 1969, University of Southern California

Ali Bulent Cambel, *Professor of Engineering and Applied Science*
B.S. 1942, Robert College, Turkey; M.S. 1946, California Institute of Technology; Ph.D. 1950, University of Iowa

John Paul Campbell, *Research Professor of Engineering*
B.S. 1939, Auburn University

Larry L. Campbell, *Associate Professorial Lecturer in Engineering*
B.S. in E.E. 1966, Ph.D. 1970, University of Utah

John H. Carson, *Assistant Professorial Lecturer in Engineering*
B.S. 1969, M.S. 1970, Ph.D. 1976, Lehigh University

James Edward Carter, *Assistant Professorial Lecturer in Engineering*
B.S. 1966, Ph.D. 1972, Virginia Polytechnic Institute and State University; M.S. 1968, Massachusetts Institute of Technology

William Harold Carter, *Associate Professorial Lecturer in Engineering*
B.S. in E.E. 1962, M.S. in E.E. 1963, Ph.D. 1966, University of Texas

Brian Leonard Clarkson, *Adjunct Professor of Engineering and Applied Science*
B.S. 1951, Ph.D. 1953, University of Leeds

George Martin Coburn, *Professorial Lecturer in Law*
B.A. 1947, LL.B. 1949, Harvard University

Paul LeRoy Coe, Jr., *Associate Professorial Lecturer in Engineering*
B.S. 1966, Hofstra University; M.S. 1967, Ph.D. 1972, New York University

James Thomas Coleman, *Professorial Lecturer in Engineering*
B.S. 1949, B.S. 1951, John Brown University; M.S. in E.E. 1954, University of Arkansas; Ph.D. 1967, Temple University

Terry Leo Collins, *Assistant Professorial Lecturer in Engineering*
B.S. in E.E. 1967, Massachusetts Institute of Technology; M.S. in E.E. 1969, University of Wisconsin; D.Sc. 1976, George Washington University

Jack William Cowan, *Assistant Professorial Lecturer in Engineering*
B.S. 1974, M.S. 1975, Naval Postgraduate School

Paul Arthur Crafton, *Professor of Engineering Administration*
B.M.E. 1944, City University of New York, City College; M.S. 1950, Ph.D. 1956, University of Maryland

Milton Orlo Critchfield, *Assistant Professorial Lecturer in Engineering*
B.S. 1963, M.S. 1965, Pennsylvania State University; Ph.D. 1971, University of Illinois

William Fay Croswell, *Professorial Lecturer in Engineering*
B.S. 1952, Virginia Military Institute; M.S. 1954, Air Force Institute of Technology

Michael Charles Cullingford, *Associate Professorial Lecturer in Engineering*
B.Sc. 1961, University of Durham, England; M.Sc. 1966, King's College, England; Ph.D. 1975, North Carolina State University

Edward N. C. Dalder, *Assistant Professorial Lecturer in Engineering*
B.Met.E. 1956, M.S. Met.E. 1964, Polytechnic Institute of New York; Ph.D. 1973, Ohio State University

Allen Das, *Associate Professorial Lecturer in Engineering*
B.S. 1945, M.S. 1947, Calcutta University; Ph.D. 1962, University of London

Robert Dillon, *Professorial Lecturer in Engineering*
B.A. 1949, University of Washington; M.A. in Arch. 1952, University of Florida

Louis Divone, *Professorial Lecturer in Engineering*
B.Ae.E. 1955, Polytechnic Institute of New York; M.S. 1956, Massachusetts Institute of Technology

Philip Donely, *Professorial Lecturer in Engineering*
B.S. 1931, Massachusetts Institute of Technology

Roger Doyon, *Assistant Professorial Lecturer in Engineering*
B.S. 1957, University of New Hampshire; M.E.A. 1964, George Washington University

Norman Abbott Dresner, *Assistant Professorial Lecturer in Engineering*
B.S. 1963, Rensselaer Polytechnic Institute; M.A. 1965, Yeshiva University

John Edward Duberg, *Adjunct Professor of Engineering*
B.S. 1938, Manhattan College; M.S. 1940, Virginia Polytechnic Institute and State University; Ph.D. 1948, University of Illinois

Charles Earl Dunham, *Associate Professorial Lecturer in Engineering*
B.S. 1963, Rochester Institute of Technology; M.S. in E.E. 1966, Ph.D. 1972, Syracuse University

Jules Berthold Du Peza, *Professorial Lecturer in Engineering*
B.S. 1949, U.S. Coast Guard Academy; M.S. 1964, Naval Postgraduate School

Donald Ray Edmonds, *Associate Professorial Lecturer in Engineering*
B.S. in M.E. 1960, B.A. 1960, Rutgers—The State University; M.S. 1966, Ph.D. 1973, Ohio State University

John Eftis, *Professor of Engineering and Applied Science and Adjunct Professor of Mathematics*
B.C.E. 1952, City University of New York, City College; M.S. in C.E. 1958, Columbia University; D.Sc. 1967, George Washington University

Marvin Eisenberg, *Professor of Engineering and Applied Science*
B.S. in E.E. 1953, University of Miami; M.S. in Engr. 1954, Ph.D. 1961, University of Florida

Donald Ellison, *Associate Professorial Lecturer in Engineering*
B.S. 1948, Tri-State College; M.P.A. 1951, Cornell University

Wayne Douglas Erickson, *Professorial Lecturer in Engineering*
B.S. 1954, M.S. 1955, Michigan State University; M.S. 1958, D.Sc. 1962, Massachusetts Institute of Technology

Donald Michael Esterling, *Associate Professor of Engineering*
B.S. 1964, University of Notre Dame; M.A. 1966, Ph.D. 1968, Brandeis University

Joel Ettinger, *Associate Professorial Lecturer in Engineering*
B.C.E. 1967, City University of New York, City College; M.S. 1969, Northwestern University

James Edward Falk, *Professor of Operations Research*
B.E.E. 1960, University of Detroit; M.S. 1961, Ph.D. 1965, University of Michigan

Fereidoun Farassat, *Associate Research Professor of Applied Science*
B.E. 1967, American University of Beirut; M.S. 1970, Syracuse University; Ph.D. 1973, Cornell University

James Elmer Feir, *Professor of Civil Engineering; Associate Dean of the School of Engineering and Applied Science*
B.S. 1950, University of Alberta; M.S. 1955, University of London; Ph.D. 1966, Cambridge University

David Feit, *Associate Professorial Lecturer in Engineering*
B.A. 1958, B.S. 1959, M.S. 1961, Eng.Sc.D. 1964, Columbia University

Charles Feldman, *Adjunct Professor of Engineering*
B.A. 1944, M.A. 1949, Johns Hopkins University; Ph.D. 1952, University of Paris

Michael Bliss Feldman, *Assistant Professor of Engineering and Applied Science*
B.S.E. 1966, Princeton University; M.S.E. 1970, Ph.D. 1973, University of Pennsylvania

Anthony Vincent Fiacco, *Professor of Operations Research*
B.A. 1950, Union College, New York; Ph.D. 1967, Northwestern University

Salvatore John Ficarro, *Assistant Professorial Lecturer in Engineering*
B.S. in C.E. 1959, Pennsylvania State University

Francis Edward Field, *Assistant Professorial Lecturer in Engineering*
B.S. 1945, U.S. Naval Academy; M.A. 1965, George Washington University

Stanley Melvin Finger, *Assistant Professorial Lecturer in Engineering*
B.A. 1969, Pratt Institute; M.S. 1972, Ph.D. 1975, University of Maryland

John Bruce Fisher, *Associate Professorial Lecturer in Engineering*
B.S. 1950, St. Lawrence University

Ronald Jeffry Fisher, *Associate Professorial Lecturer in Engineering*
B.S. in C.E. 1958, Bucknell University; M.E. 1959, University of California, Berkeley

Joseph Foa, *Professor of Engineering and Applied Science*
Dr.Ing. (M.E.) 1931, Polytechnic Institute of Torino; Dr.Ing. (A.E.) 1933, University of Rome

James David Foley, *Associate Professor of Engineering and Applied Science*
B.S. 1964, Lehigh University; M.S. 1965, Ph.D. 1969, University of Michigan

Charles William Fotis, *Professorial Lecturer in Engineering*
B.A. 1937, M.A. 1939, Tufts University; Ph.D. 1959, American University

Edwin Clement Foudriat, *Associate Professorial Lecturer in Engineering*
B.S. 1950, University of Illinois; M.S. 1956, Ph.D. 1966, Ohio State University

Paul Jeffery Fox, *Assistant Professorial Lecturer in Engineering*
B.S. 1969, Yale University; M.S. and E.E. 1973, Massachusetts Institute of Technology

Raymond Richard Fox, *Professor of Engineering and Applied Science*
B.S. in C.E. 1949, M.S. in C.E. 1952, University of Washington

Robert William Fralich, *Associate Professorial Lecturer in Engineering*
B.Ae.E. 1947, University of Cincinnati; M.Ae.E. 1952, University of Virginia; Ph.D. 1963, Virginia Polytechnic Institute and State University

Gabriel Frenkel, *Associate Professorial Lecturer in Engineering*
B.S. 1956, The Cooper Union; M.S. 1960, City University of New York, City College; Ph.D. 1972, George Washington University

Arthur D. Friedman, *Professor of Engineering and Applied Science*
B.A. 1961, B.S. in E.E. 1962, M.S. in E.E. 1963, Ph.D. 1965, Columbia University

Fred Frishman, *Professorial Lecturer in Engineering*
B.B.A. 1947, City University of New York, City College; B.A. 1956, M.A. 1957, Ph.D. 1971, George Washington University

Yuen-sun Fu, *Assistant Professorial Lecturer in Engineering*
B.S. 1955, Taipei Institute of Technology; M.S. 1959, Kansas State University; Ph.D. 1975, University of Kansas

Robert Earle Fulton, *Professorial Lecturer in Engineering*
B.S. 1953, Auburn University; M.S. 1958, Ph.D. 1960, University of Illinois

Charles Alexander Garris, *Associate Professor of Engineering*
B.E. 1965, State University of New York, Maritime College; M.S. 1968, Ph.D. 1971, State University of New York at Stoney Brook

Michael Paul Gaus, *Professorial Lecturer in Engineering*
B.S. 1954, M.S. 1956, Ph.D. 1959, University of Illinois

Amritpal Singh Gill, *Associate Professorial Lecturer in Engineering*
B.S. in E.E. 1963, Howard University; M.S. 1965, George Washington University

Charles Matthew Gilmore, *Associate Professor of Engineering and Applied Science*
B.S. 1963, M.S. 1964, Pennsylvania State University; Ph.D. 1971, University of Maryland

Michael Stanley Gluck, *Assistant Professorial Lecturer in Engineering*
B.S. 1961, City University of New York, City College; M.S. 1963, New York University; D.Sc. 1978, George Washington University

Ernest Glynn, *Associate Professorial Lecturer in Engineering*
B.S. 1956, University of Maryland

Walter Anthony Goetz, *Associate Professorial Lecturer in Engineering*
B.S. in M.E. 1960, Michigan State University; M.E.A. 1974, George Washington University

Jeffrey Archibald Gorman, *Assistant Professorial Lecturer in Engineering*
B.C.E. 1958, Cornell University; M.S. 1966, Ph.D. 1968, California Institute of Technology

Robert Goulard, *Professor of Engineering and Applied Science*
Ae.E. 1949, Ecole Nationale Superieure de l'Aeronautique; Ph.D. 1957, Purdue University

Richard Stiles Greeley, *Professorial Lecturer in Engineering*
B.S. 1949, Harvard University; M.S. 1951, Northwestern University; Ph.D. 1959, University of Tennessee

Truman Lewis Griswold, *Assistant Professorial Lecturer in Engineering*
B.S.Aero.E. 1949, University of Cincinnati; M.E.A. 1964, George Washington University

Donald Gross, *Professor of Operations Research*
B.S. 1956, Carnegie-Mellon University; M.S. 1959, Ph.D. 1962, Cornell University

Jatinder Gupta, *Professorial Lecturer in Engineering*
B.E. 1963, Delhi University; M.Tech. 1967, Indian Institute of Technology; Ph.D. 1969, Texas Tech University

Irving Haber, *Associate Professorial Lecturer in Engineering*
B.E.E. 1961, The Cooper Union; M.S. 1965, Ph.D. 1969, Polytechnic Institute of New York

John Frederick Halldane, *Professorial Lecturer in Engineering*
B.S. 1959, B.Arch. 1961, University of New Zealand; Ph.D. 1968, University of Auckland

Barry Wellesley Hannah, *Adjunct Associate Professor of Engineering*
B.S. 1963, M.S. 1965, Ph.D. 1973, University of Cincinnati

Jay Charles Hardin, *Associate Professorial Lecturer in Engineering*
B.S. 1964, M.A. 1965, Ph.D. 1969, Purdue University

Donald P. Hearth, *Professorial Lecturer in Engineering*
B.S. 1951, Northeastern University

John Hebrank, *Assistant Professorial Lecturer in Engineering*
B.S. 1970, Ph.D. 1974, Duke University

Hermann Josef Helgert, *Associate Professor of Engineering and Applied Science*
B.S. 1962, M.S. 1964, Ph.D. 1966, State University of New York at Buffalo

Robert Bernard Heller, *Professor of Engineering and Applied Science*
B.S. 1946, M.S. 1948, Ph.D. 1951, St. Louis University

Lloyd George Herman, *Professorial Lecturer in Engineering*
B.S.A. 1934, Ontario Agricultural College; Ph.D. 1948, McGill University

Karla R. Hoffman, *Assistant Professorial Lecturer in Engineering*
B.A. 1969, Rutgers—The State University; M.B.A. 1971, D.Sc. 1975, George Washington University

Lance J. Hoffman, *Associate Professor of Engineering and Applied Science*
B.S. 1964, Carnegie-Mellon University; M.S. 1967, Ph.D. 1970, Stanford University

Douglas LeRoy Hogan, *Professorial Lecturer in Engineering*
B.S. 1950, George Washington University; M.S. 1954, E.E. 1961, Massachusetts Institute of Technology

Richard Frank Hoglund, *Professorial Lecturer in Engineering*
B.S. 1954, M.S. 1955, Ph.D. 1960, Northwestern University

Gerald M. Hollander, *Associate Professorial Lecturer in Engineering*
B.S. in M.E. 1949, University of South Carolina; M.A. 1965, George Washington University; Ph.D. 1974, Walden University

Lawrence Melvin Holt, *Assistant Professorial Lecturer in Engineering*
B.S. 1966, St. Joseph's College; M.A. 1969, University of Maryland; M.S. 1977, Virginia Polytechnic Institute and State University

Barry Martin Horowitz, *Associate Professorial Lecturer in Engineering*
B.E.E. 1965, City University of New York, City College; M.S. 1967, Ph.D. 1969, New York University

Joel Lawrence Horowitz, *Associate Professorial Lecturer in Engineering*
B.S. 1962, Stanford University; Ph.D. 1967, Cornell University

Alexander Hoshovsky, *Associate Professorial Lecturer in Engineering*
B.A. 1952, Saint Mary's University; M.S. 1963, George Washington University; Ph.D. 1973, American University

H. Kwang-Wu Hung, *Assistant Professorial Lecturer in Engineering*
B.S. 1961, Cheng Kung University; M.S. 1964, University of Florida; M.S. 1969, Rutgers—The State University; Ph.D. 1973, University of Massachusetts

John Frederic Ince, *Assistant Professorial Lecturer in Engineering*
B.S. 1966, Webb Institute of Naval Architecture; M.S. 1968, Massachusetts Institute of Technology; M.S. 1972, D.Sc. 1978, George Washington University

Casimir Joseph Jachimowski, *Associate Professorial Lecturer in Engineering*
B.S. 1960, DePaul University; Ph.D. 1964, Michigan State University

Douglas Linwood Jones, *Associate Professor in Engineering*
B.M.E. 1963, M.S. in Engr. 1965, D.Sc. 1970, George Washington University

Kay Howard Jones, *Professorial Lecturer in Engineering*
B.S. 1956, University of Washington; M.S. 1961, Ph. D. 1968, University of California, Berkeley

Henry David Kahn, *Assistant Professorial Lecturer in Engineering*
B.E.S. 1967, Johns Hopkins University; M.S. 1969, University of Miami; D.Sc. 1977, George Washington University

Walter Kurt Kahn, *Professor of Engineering and Applied Science*
B.E.E. 1951, The Cooper Union; M.E.E. 1954, D.E.E. 1960, Polytechnic Institute of New York

Robert Kwei-Chuan Kao, *Visiting Assistant Research Professor of Engineering*
B.S. 1962, National Taiwan University; M.E. 1966, University of South Carolina; Ph.D. 1970, Catholic University of America

David Carl Karlgaard, *Assistant Professorial Lecturer in Engineering*
B.S. 1967, University of Wisconsin—Eau Claire; M.S. 1968, Michigan State University; D.Sc. 1974, George Washington University

J.V. Richard Kaufman, *Research Professor of Engineering and Applied Science*
B.S. 1940, Dickinson College; Ph.D. 1944, Massachusetts Institute of Technology

Roger Emanuel Kaufman, *Professor of Engineering*
B.S. 1962, Tufts University; M.F.A. 1965, Yale University; M.E. 1968, Ph.D. 1969, Rensselaer Polytechnic Institute

John Kaye, *Professor of Engineering and Applied Science*
B.S. in M.E. 1939, M.S. in M.E. 1948, California Institute of Technology

John Keenan, *Assistant Professorial Lecturer in Engineering*
B.S. 1967, Ph.D. 1974, Pennsylvania State University; M.S. 1968, University of Pittsburgh

Azer Kehnemui, *Assistant Professorial Lecturer in Engineering*
B.S. 1962, Robert College, Turkey; M.S. 1963, University of Illinois; D.Sc. 1976, George Washington University

Khalilollah Khozeimeh, *Assistant Research Professor of Engineering and Applied Science*
B.C.E. 1965, M.S. 1967, D.Sc. 1974, George Washington University

Ali Muhlis Kiper, *Professor of Engineering*
M.S. in M.E. 1950, Technical University of Istanbul; M.S. in M.E. 1954, Ph.D. 1956, Purdue University

Joseph Kirshner, *Professorial Lecturer in Engineering*
B.S. 1947, University of Delaware; M.S. 1952, University of Maryland

Vladislav Klein, *Associate Research Professor of Engineering*
M.E. 1954, Technical University, Czechoslovakia; Ph.D. 1974, Cranfield Institute of Technology, U.K.

Joseph Alexander Knight, *Associate Professorial Lecturer in Engineering*
B.S.(E.E.) 1963, Virginia Polytechnic Institute and State University; M.S.(E.E.) 1965, Ph.D. 1968, Georgia Institute of Technology

Peter Yuk-Lam Ko, *Assistant Professor of Engineering and Applied Science*
B.S. 1971, University of Hawaii; M.S. 1974, Massachusetts Institute of Technology; Ph.D. 1978, Stanford University

Edward Charles Kollmann, *Adjunct Professor of Engineering*
B.S. 1941, Bowdoin College; M.A. 1947, Ph.D. 1950, Harvard University

Abdel Kader Koth, *Professorial Lecturer in Engineering*
B.S. 1957, Cairo University; M.S. 1961, Ph.D. 1964, University of Oklahoma

Nicholas Kyriakopoulos, *Associate Professor of Engineering*
B.E.E. 1960, M.S. in Engr. 1963, D.Sc. 1968, George Washington University

Kirby Lamar, *Assistant Professorial Lecturer in Engineering*
B.S. 1949, U.S. Military Academy; M.S.E. 1955, University of Michigan

Paul A. Lamb, *Assistant Professorial Lecturer in Engineering*
B.S. (E.E.) 1960, University of Arizona; M.B.A. 1973, University of California, Los Angeles

Roger Henry Lang, *Associate Professor of Engineering and Applied Science*
B.S. in E.E. 1962, M.S. in E.E. 1964, Ph.D. 1968, Polytechnic Institute of New York

Robert Edward Lawrence, *Associate Professorial Lecturer in Engineering*
B.S. in E.E. 1968, M.S. 1969, Ph.D. 1972, Rensselaer Polytechnic Institute

Henry Edward Lee, *Associate Professorial Lecturer in Engineering*
B.S. in E.E. 1967, Pennsylvania State University; M.S. 1968, Ph.D. 1970, University of Pennsylvania

James Der-Yi Lee, *Associate Research Professor of Engineering*
B.S. 1964, Taiwan University; M.S. 1967, Rice University; Ph.D. 1971, Princeton University

Robert Lee, *Assistant Professorial Lecturer in Engineering*
B.S. 1972, M.S. 1975, George Washington University

Ting N. Lee, *Associate Professor of Engineering and Applied Science*
B.S. in E.E. 1962, Cheng Kung University, Taiwan; M.S. in E.E. 1965, Illinois Institute of Technology; Ph.D. 1972, University of Wisconsin

Stephen B. Leighton, *Associate Professorial Lecturer in Engineering*
B.S. 1968, Yale University; M.S. 1969, D.Sc. 1976, Massachusetts Institute of Technology

David Richard Levin, *Associate Professorial Lecturer in Engineering*
B.A. 1934, M.A. 1936, J.D. 1936, Ph.D. 1937, University of Wisconsin

S. Benedict Levin, *Research Professor of Engineering Administration*
B.A. 1931, B.S. 1932, E.M. 1933, Ph.D. 1948, Columbia University

David Michael Le Vine, *Associate Professorial Lecturer in Engineering*
B.S.E. 1963, M.S.E. 1964, M.S. 1966, Ph.D. 1968, University of Michigan

Robert Sidney Levine, *Professorial Lecturer in Engineering*
B.Sc. 1943, Iowa State University; M.Sc. 1946, Sc.D. 1949, Massachusetts Institute of Technology

Hai Sang Lew, *Associate Professorial Lecturer in Engineering*
B.S. 1960, Washington University; M.S. 1963, Lehigh University; Ph.D. 1968, University of Texas

Herbert Arthur Leybold, *Associate Professorial Lecturer in Engineering*
B.C.E. 1955, Polytechnic Institute of New York; M.S. in M.E. 1963, Virginia Polytechnic Institute and State University; Ph.D. 1969, North Carolina State University at Raleigh

Harold Liebowitz, *Professor of Engineering and Applied Science; Dean of the School of Engineering and Applied Science*
B.Ae.E. 1944, M.Ae.E. 1946, D.Ae.E. 1948, Polytechnic Institute of New York

Don A. Linger, *Professorial Lecturer in Engineering*
B.S. 1954, The Colorado College; M.S. 1956, New Mexico State University; Ph.D. 1960, Iowa State University

Elmer M. Lipsey, *Professorial Lecturer in Engineering*
B.S. 1944, U.S. Coast Guard Academy; M.S. in E.E. 1958, Air Force Institute of Technology; D.Sc. 1975, George Washington University

Shih-Chi Liu, *Associate Professorial Lecturer in Engineering*
B.S. 1960, National Taiwan University; M.S. 1964, Ph.D. 1967, University of California, Berkeley

Thomas Phillip George Liverman *Professor of Mathematics and Adjunct Professor of Engineering and Applied Science*
B.A. 1941, University of Montpellier, France; M.A. 1948, Ph.D. 1956, University of Pennsylvania

David D. Loendorf, *Assistant Professorial Lecturer in Engineering*
B.S. 1969, M.S. 1971, Old Dominion University; M.S. 1974, University of Michigan

Murray Howard Loew, *Adjunct Associate Professor of Engineering*
B.S.E.E. 1965, Drexel Institute of Technology; M.S.E.E. 1967, Ph.D. 1972, Purdue University

Laurence Keith Loftin, Jr., *Professorial Lecturer in Engineering*
B.M.E. 1943, University of Virginia

Robert Edgar Lohfeld, *Assistant Professorial Lecturer in Engineering*
B.S.E. 1968, Catholic University of America; M.S. 1972, University of Maryland

Gerald Dean Love, *Professorial Lecturer in Engineering*
B.S. in C.E. 1949, M.S. in C.E. 1956, Iowa State University; D.Eng. 1975, Rensselaer Polytechnic Institute

Robert John Lynch, Jr., *Associate Professorial Lecturer in Engineering*
B.S. 1963, Naval Postgraduate School; M.E.A. 1975, George Washington University

Khalid Mahmood, *Professor of Engineering*
B.A. 1950, B.S. 1953, Panjab University; M.S. 1964, University of Washington; Ph.D. 1971, Colorado State University

George T. Malley, *Professorial Lecturer in Engineering*
B.A. 1936, University of Rochester; J.D. 1948, Cornell University

Arthur Frank Manfredi, Jr., *Assistant Professorial Lecturer in Engineering*
B.S. 1965, The Cooper Union; M.S. 1968, Polytechnic Institute of New York; D.Sc. 1975, George Washington University

Nancy R. Mann, *Research Professor of Engineering*
B.A. 1948, M.A. 1949, Ph.D. 1965, University of California, Los Angeles

J. Richard Margulies, *Assistant Professorial Lecturer in Engineering*
B.S. 1967, Cornell University; M.E.A. 1971, George Washington University; J.D. 1974, Georgetown University

William Henry Marlow, *Professor of Operations Research*
B.S. 1947, St. Ambrose College; M.S. 1948, Ph.D. 1951, University of Iowa

Ward Douglas Maurer, *Professor of Engineering and Applied Science*
B.S. 1958, University of Chicago; M.A. 1962, Ph.D. 1965, University of California, Berkeley

Richard McConnell, *Associate Professorial Lecturer in Engineering*
B.C.E. 1950, George Washington University; M.S. 1960, University of Illinois; Ph.D. 1974, Catholic University of America

Garth Philip McCormick, *Professor of Applied Science*
B.A. 1956, Oberlin College; M.A. 1959, University of Michigan

Terrence Patrick McGarty, *Professorial Lecturer in Engineering*
B.E. 1965, Manhattan College; M.S. 1966, E.E. 1969, Ph.D. 1971, Massachusetts Institute of Technology

Thomas McGean, *Associate Professorial Lecturer in Engineering*
B.M.E. 1959, New York University, M.S. 1960, California Institute of Technology

Gerald Robert McNichols, *Associate Professorial Lecturer in Engineering*
B.S. 1965, Case Western Reserve University, M.S. 1966, University of Pennsylvania; D.Sc. 1976, George Washington University

Alvin Greene McNish, *Adjunct Professor of Engineering*
B.A. 1924, M.A. 1931, George Washington University

Arnold Charles Meltzer, *Professor of Engineering and Applied Science*
B.S. in Engr. 1958, M.S. in Engr. 1961, D.Sc. 1967, George Washington University

Richard Eugene Merwin, *Research Professor of Engineering*
B.S. in E.E. 1943, Ph.D. 1965, University of Pennsylvania; M.S. in E.E. 1960, Syracuse University

David John Michel, *Professorial Lecturer in Engineering*
B.S. 1964, University of Missouri, Rolla, M.S. 1966, Ph.D. 1968, Pennsylvania State University

Charles Molloy, *Professorial Lecturer in Engineering*
B.S. 1935, The Cooper Union; M.S. 1938, Ph.D. 1948, New York University

Raymond Clifton Montgomery, *Assistant Professorial Lecturer in Engineering*
B.S. 1963, M.S. 1964, University of Alabama; Ph.D. 1969, Virginia Polytechnic Institute and State University

David Dunstan Moran, *Associate Professorial Lecturer in Engineering*
B.S. 1965, M.S. 1967, Massachusetts Institute of Technology; Ph.D. 1971, University of Iowa

Daniel Mulville, *Assistant Professorial Lecturer in Engineering*
B.S. in M.E. 1962, M.S. 1966, George Washington University; Ph.D. 1974, Catholic University of America

Michael Kenneth Myers, *Professor of Engineering and Applied Science*
B.A. 1962, Willamette University; B.S. 1962, M.S. 1963, Ph.D. 1966, Columbia University

Christopher Ng, *Associate Professorial Lecturer in Engineering*
B.S. 1944, Chiao-Tung University (China); M.S. 1959, University of Connecticut; Ph.D. 1973, University of Maryland

Ahmed Khairy Noor, *Professor of Engineering and Applied Science*
B.S. 1958, Cairo University; M.S. 1961, Ph.D. 1963, University of Illinois

Max H. Novinsky, *Assistant Professorial Lecturer in Engineering*
B.C.E. 1941, City University of New York, City College; M.E.A. 1968, D.Sc. 1976, George Washington University

Walter Robert Nunn, *Professorial Lecturer in Engineering*
B.A. 1957, M.A. 1961, University of California, Ph.D. 1972, George Washington University

Barry David Nussbaum, *Assistant Professorial Lecturer in Engineering*
B.S. 1968, Rensselaer Polytechnic Institute, M.S. 1971, D.Sc. 1978, George Washington University

Michel Kazuo Ochi, *Professorial Lecturer in Engineering*
B.Eng. 1944, Osaka Imperial University; M.A. 1967, American University; D.Eng. 1957, Osaka University

Morris Solomon Ojalvo, *Professorial Lecturer in Engineering and Applied Science*
B.M.E. 1944, The Cooper Union; M.M.E. 1949, University of Delaware; Ph.D. 1962, Purdue University

John Pachter, *Professorial Lecturer in Engineering*
B.A. 1963, Tulane University; J.D. 1966, LL.M. 1970, George Washington University

Kent Stephen Park, *Assistant Professorial Lecturer in Engineering*
B.S. 1964, Shippensburg State College; M.S. in Applied Math. 1967, Ph.D. 1970, North Carolina State University at Raleigh

Robert Lewis Paullin, *Associate Professorial Lecturer in Engineering*
B.S. in M.E. 1950, South Dakota School of Mines and Technology; M.S. in C.E. 1966, University of California, Berkeley

S. F. Pauls, *Assistant Professorial Lecturer in Engineering*
B.A. 1958, College of William and Mary; M.S.A. 1970, George Washington University

Raymond Pickholtz, *Professor of Engineering and Applied Science*
B.E.E. 1954, M.E.E. 1958, City University of New York, City College; Ph.D. 1966, Polytechnic Institute of New York

Pathickal K. Poulose, *Assistant Research Professor of Engineering*
B.S. 1959, University of Kerala; B.E. 1965, M.E. 1967, Indian Institute of Science; Ph.D. 1973, University of Connecticut

Douglas Haig Pugh II, *Assistant Professorial Lecturer in Engineering*
B.A. 1973, University of Maryland

Manuel Jack Queijo, *Professorial Lecturer in Engineering*
B.S. 1944, Worcester Polytechnic Institute; M.S. 1954, University of Virginia; Ph.D. 1963, Virginia Polytechnic Institute and State University

Jerome Mark Raffel, *Associate Professorial Lecturer in Engineering*
B.S. in E.E. 1958, University of Maryland; M.S.E. 1962, Catholic University of America

Walter Phillip Reid, *Adjunct Professor of Engineering*
B.S. 1938, M.S. 1939, Carnegie-Mellon University; Ph.D. 1942, University of Pittsburgh

Fred Joseph Ricci, *Associate Professorial Lecturer in Engineering*
B.S. 1962, Michigan State University; M.S. 1966, Newark College of Engineering; Ph.D. 1973, Catholic University of America

Lucius Joseph Riccio, *Associate Professorial Lecturer in Engineering*
B.S. in I.E. 1969, M.S. in I.E. 1970, Ph.D. 1973, Lehigh University

David Caron Roberts, *Associate Professorial Lecturer in Engineering*
B.S. 1965, Johns Hopkins University; M.S.E. 1968, University of Pennsylvania; M.S. 1973, University of Maryland

James Bratton Robertson, *Assistant Professorial Lecturer in Engineering*
B.S. 1956, The Citadel; B.S. 1961, M.S. 1962, Clemson University; Ph.D. 1966, Virginia Polytechnic Institute and State University

Derrill Conway Rohlfs, *Associate Professorial Lecturer in Engineering*
B.E.E. 1955, M.S. in Engr. 1959, George Washington University

Peter David Rosenberg, *Associate Professorial Lecturer in Engineering*
B.A. 1962, B.Ch.E. 1963, New York University; J.D. 1968, New York Law School; LL.M. 1971, George Washington University

Sam Rothman, *Professor of Engineering Administration*
B.S. 1943, Long Island University; M.A. 1954, Ph.D. 1959, American University

Meir Rozansky, *Associate Professorial Lecturer in Engineering*
B.S.(M.E.) 1973, M.E.A. 1974, George Washington University

Llewellyn Adam Rubin, *Associate Professorial Lecturer in Engineering*
B.S.(E.E.) 1955, M.S.(E.E.) 1958, University of Pennsylvania

Harry Runyan, Jr., *Associate Research Professor of Engineering*
B.S.(M.E.) 1939, Rutgers—The State University; M.A.E. 1951, University of Virginia; Ph.D. 1974, Loughborough University of Technology

Gajanan Sabnis, *Associate Professorial Lecturer in Engineering*
B.S. in C.E. 1961, University of Bombay; M.Tech. 1963, Indian Institute of Technology, Bombay; Ph.D. 1967, Cornell University

Kenneth Saczalski, *Associate Professorial Lecturer in Engineering*
B.S. in M.E. 1963, University of Miami; M.S. 1967, University of Rochester; Ph.D. 1970, University of Wisconsin

Smanchai Sae-Ung, *Assistant Research Professor of Engineering*
B.Eng. 1969, Chulalongkorn University, Thailand; M.S.(C.E.) 1971, Ph.D. 1976, Purdue University

Robert Bruce Samworth, *Associate Professorial Lecturer in Engineering*
B.C.E. 1959, University of Delaware; M.S. in Engr. 1962, Johns Hopkins University; Ph.D. 1968, Cornell University

John Baptist Scalzi, *Professorial Lecturer in Engineering*
B.S. 1938, Worcester Polytechnic Institute; M.S. 1940, D.Sc. 1951, Massachusetts Institute of Technology

Allan Schneider, *Associate Professorial Lecturer in Engineering*
B.S. in E.E. 1959, B.S.E.P. 1960, Lehigh University; M.S. in E.E. 1962, Columbia University; Ph.D. 1974, University of Maryland

Richard Edgar Schneider, *Assistant Professorial Lecturer in Engineering*
B.S. in E.E. 1961, Villanova University; M.S. in E.E. 1971, Rochester Institute of Technology

Richard Sears, *Associate Professorial Lecturer in Engineering*
B.M.E. 1964, M.M.E. 1968, City University of New York, City College

Bhupendra P. Shah, *Associate Professorial Lecturer in Engineering*
B.E. 1956, Baroda University, India; M.E. 1958, Indian Institute of Science; M.E.E. 1961, Syracuse University

Presson Scott Shane, *Professor of Engineering Administration*
B.S. in Ch.E. 1941, University of Kansas, M.S. 1946, Massachusetts Institute of Technology

Ramesh Shankar, *Assistant Professorial Lecturer in Engineering*
B.Tech. 1969, Indian Institute of Technology; M.E.E. 1972, Ph.D. 1978, University of Delaware

Ismail N. Shimi, *Professorial Lecturer in Engineering*
B.S. 1957, Ain Shams University; Ph.D. 1961, University of North Carolina

Arnold Roy Shulman, *Associate Professorial Lecturer in Engineering*
B.E.E. 1948, New York University; M.S. in E.E. 1953, Newark College of Engineering

Robert David Shults, *Associate Professorial Lecturer in Engineering*
B.E.E. 1960, M.S. in E.E. 1963, Ph.D. 1968, Georgia Institute of Technology

Barry Silverman, *Assistant Professor of Engineering*
B.S.E. 1975, M.S.E. 1977, Ph.D. 1977, University of Pennsylvania

Joseph Robert Silverman, *Associate Professorial Lecturer in Engineering*
B.S. in E.E. 1959, Northeastern University; M.S. 1968, George Washington University

Nozer Darabsha Singpurwalla, *Professor of Operations Research and Professor of Statistics*
B.S. 1959, B.V. Bhoomraddi College of Engineering and Technology, India; M.S. in I.E. 1964, Rutgers—The State University; Ph.D. 1968, New York University

Earl Franklin Skelton, *Associate Professorial Lecturer in Engineering*
B.S. 1962, Fairleigh Dickinson University; Ph.D. 1967, Rensselaer Polytechnic Institute

David Russell Smith, *Assistant Professorial Lecturer in Engineering*
B.S. 1967, Randolph-Macon College; M.S. (E.E.) 1970, Georgia Institute of Technology; D.Sc. 1977, George Washington University

George Louis Smith, *Assistant Professorial Lecturer in Engineering*
B.S. 1960, M.S. 1963, Ph.D. 1968, Virginia Polytechnic Institute and State University

Jaroslaw Sobieszczanski, *Associate Professorial Lecturer in Engineering*
B.S. 1955, M.S. 1957, Ph.D. 1964, Technical University of Warsaw

Richard M. Soland, *Research Professor of Operations Research*
B.E.E. 1961, Rensselaer Polytechnic Institute; Ph.D. 1964, Massachusetts Institute of Technology

Moustafa M. Soliman *Associate Professorial Lecturer in Engineering*
B.S. 1957, Cairo University; Ph.D. 1966, University of California, Berkeley

Robert Martin Sorensen, *Adjunct Professor of Engineering*
B.S. in C.E. 1960, Newark College of Engineering; M.S. in C.E. 1962, Lehigh University; Ph.D. 1966, University of California, Berkeley

Arthur Sosslau, *Associate Professorial Lecturer in Engineering*
B.S. in C.E. 1957, Polytechnic Institute of New York

Floyd James Stanek, *Professorial Lecturer in Engineering*
B.S. 1947, M.S. 1949, Iowa State Univeristy; Ph.D. 1956, University of Illinois

Manuel Stein, *Associate Professorial Lecturer in Engineering*
B.S. in M.E. 1943, University of Pittsburgh; M.Ae.E. 1951, University of Virginia; Ph.D. 1958, Virginia Polytechnic Institute and State University

Henry Malcolm Steiner, *Professor of Engineering Administration*
B.A. in M.E. 1944, M.S. 1950, Ph.D. 1965, Stanford University

Karin Steinhaus, *Lecturer in English*
B.A. 1969, Oglethorpe University; M.A.T. 1970, School for International Training; M.S. 1978, Georgetown University

Terry Anthony Straeter, *Assistant Professorial Lecturer in Engineering*
B.A. 1964, William Jewell College; M.A. 1966, College of William and Mary; Ph.D. 1971, North Carolina State University at Raleigh

Darrell Ray Tenney, *Associate Professorial Lecturer in Engineering*
B.S. 1964, West Virginia Wesleyan; Ph.D. 1969, Virginia Polytechnic Institute and State University

Robb Milton Thomson, *Professorial Lecturer in Engineering*
M.S. 1950, University of Chicago; Ph.D. 1953, Syracuse University

Samuel Coakley Tignor, *Professorial Lecturer in Engineering*
B.S. 1958, Virginia Polytechnic and State University; M.S. (C.E.) 1966, Catholic University of America; Ph.D. 1974, University of Michigan

Robert Yen-ying Ting, *Associate Professorial Lecturer in Engineering*
B.S. 1964, National Taiwan University; M.S. 1967, Massachusetts Institute of Technology; Ph.D. 1971, University of California, San Diego

Theodore George Toridis, *Professor of Engineering and Applied Science*
B.S. 1954, Robert College, Turkey; M.S. 1961, Ph.D. 1964, Michigan State University

Julio Luis Torres, *Associate Professorial Lecturer in Engineering*
B.S. 1957, U.S. Naval Academy; M.S. 1961, E.E. 1961, Ph.D. 1966, Stanford University

Avtar Krishan Trehan, *Adjunct Assistant Professor of Engineering*
B.S. 1962, University of Allahabad, India; M.S. 1967, Brown University; Ph.D. 1971, University of Maryland

Jerry Hassell Tucker, *Assistant Professorial Lecturer in Engineering*
B.S. in E.E. 1963, Mississippi State University; M.S. in E.E. 1970, University of Virginia

Ram Vaswani, *Professorial Lecturer in Engineering*
B.E. 1941, University of Bombay; M.S. 1954, Illinois Institute of Technology; D.E.S. 1958, Columbia University

Warren Viessman, Jr., *Professorial Lecturer in Engineering*
B.E. 1952, M.S.E. 1958, D.Engr. 1961, Johns Hopkins University

Peter Williams Volkmar, *Assistant Professorial Lecturer in Engineering*
B.A. 1972, St. John's College at Santa Fe; M.S. 1976, George Washington University

Gerald David Walberg, *Assistant Professorial Lecturer in Engineering*
B.S. 1956, M.S. 1963, Virginia Polytechnic Institute and State University; Ph.D. 1974, North Carolina State University

Ezzat I. Wali, *Visiting Associate Research Professor of Engineering*
B.S. 1954, Cairo University; M.S. 1963, City University of New York, City College; Ph.D. 1971, Carnegie-Mellon University

John D. Waller, *Professorial Lecturer in Engineering*
B.S. 1959, Rockhurst College; M.S. 1962, Ph.D. 1966, University of Notre Dame

Thomas Michael Walsh, *Associate Professorial Lecturer in Engineering*
B.S. in E.E. 1953, Ohio University; M.S.E. 1962, University of Akron

Chai-Ho Charles Wang, *Associate Professorial Lecturer in Engineering*
B.A. 1964, Fort Lewis College; M.A. 1968, University of Washington; Ph.D. 1974, University of Denver

Paul Wang, *Assistant Professorial Lecturer in Engineering*
B.S. in E.E., National Taiwan University; M.S. 1970, Ph.D. 1973, State University of New York

Richard Currey Warder, Jr., *Professorial Lecturer in Engineering*
B.S. 1958, South Dakota School of Mines and Technology; M.S. 1959, Ph.D. 1963, Northwestern University

Wasyl Wasylkiwskyj, *Professorial Lecturer in Engineering*
B.E.E. 1957, City University of New York, City College; M.S. in E.E. 1965, Ph.D. 1968, Polytechnic Institute of New York

David Brubaker Webster, *Professorial Lecturer in Engineering*
A.B. 1952, Temple University; M.A. 1956, University of Wisconsin; Ph.D. 1971, American University

John Richard Weggel, *Professorial Lecturer in Engineering*
B.S. 1964, Drexel University, M.S. 1966, Ph.D. 1968, University of Illinois

Harry Weingarten, *Professorial Lecturer in Engineering*
B.A. 1943, City University of New York, City College; M.A. 1945, Columbia University; Ph.D. 1959, George Washington University

Benjamin Whang, *Professorial Lecturer in Engineering*
B.C.E. 1959, M.C.E. 1961, Polytechnic Institute of New York; Ph.D. 1968, Massachusetts Institute of Technology

John Lindsey Whitesides, Jr., *Associate Professor of Engineering and Applied Science*
B.S. 1965, Ph.D. 1968, University of Texas

Robert Wilson, *Professorial Lecturer in Engineering*
B.S. 1941, M.S. 1942, Georgia Institute of Technology; Ph.D. 1952, University of Texas

Alfred Abraham Wolf, *Professorial Lecturer in Engineering*
B.S. (E.E.) 1948, Drexel University, M.S. (E.E.) 1954, Ph.D. 1958, University of Pennsylvania

David Christopher Wood, *Associate Professorial Lecturer in Engineering*
B.S. 1963, Ph.D. 1966, University of Manchester, England

Irving David Woolf, *Assistant Professorial Lecturer in Engineering*
B.S. 1961, M.S. 1962, University of California, Berkeley

Yau Wu, *Professorial Lecturer in Engineering*
B.S. 1955, National Taiwan University; M.S. 1958, University of Illinois; M.S. 1960, Massachusetts Institute of Technology; Ph.D. 1964, New York University

Michael Yachnis, *Professorial Lecturer in Engineering*
B.S. 1943, Military College, Athens, B.S. in C.E. 1951, Military Technical Training College, Athens, M.S. in Engr. 1956, M.E.A. 1962, D.Sc. 1968, George Washington University

Jann-Nan Yang, *Professor of Engineering and Applied Science*
B.S. 1961, National Taiwan University; M.S. 1964, University of Hawaii; D.Sc. 1967, Columbia University

Edward Carson Yates, Jr., *Associate Professorial Lecturer in Engineering*
B.S. 1948, M.S. 1949, North Carolina State University at Raleigh; M.S. 1953, University of Virginia, Ph.D. 1959, Virginia Polytechnic Institute and State University

A. M. Yen, *Associate Professorial Lecturer in Engineering*
B.S. in E.E. 1960, Taipei Institute of Technology; Ph.D. 1969, Johns Hopkins University

James Chun-ying Yu, *Associate Professorial Lecturer in Engineering*
B.S. 1962, National Taiwan University; M.S. 1968, Ph.D. 1971, Syracuse University

Shao Wen Yuan, *Professor of Engineering and Applied Science*
B.S. 1936, University of Michigan; M.S. 1937, Ph.D. 1941, California Institute of Technology; Ae.E. 1939, Stanford University

Arthur Zachai, *Associate Professorial Lecturer in Engineering*
B.S. in E.E. 1965, Case Western Reserve University; M.S. 1971, George Washington University

Tse-Fou Zien, *Professorial Lecturer in Engineering*
B.S. 1958, National Taiwan University; M.S. 1963, Brown University; Ph.D. 1967, California Institute of Technology

Arthur Jay Ziffer, *Associate Professorial Lecturer in Engineering*
B.S. 1952, City University of New York, Queens College, M.S. 1954, University of Chicago

FACTS ABOUT GEORGE WASHINGTON UNIVERSITY

General Information	Private, nonsectarian, coeducational founded 1821
Location	Washington, D.C., bounded by Pennsylvania Avenue and 19th, F, and 24th Streets, N.W.
Number of On-Campus Students	8,537 full-time; 8,263 part-time (equivalent to 12,386 full-time students altogether)
Geographical Origin of Students	50 states, District of Columbia, 120 countries
Number of Full-time Faculty	1,019 (81% with doctoral degrees)
Number of Part-time Faculty	493 (includes some of the most distinguished men and women in Washington)
Residence Hall Space	2,072
Room and Board	Cost varies from $1,970 to $2,320 for the academic year (see pages 217–219)

Undergraduate majors: Accounting, American Civilization, American Literature, Anthropology, Applied Mathematics, Applied Statistics, Art History, Biology, Botany, Business Administration, Cartography, Chemistry, Chinese Language and Literature, Civil Engineering, Classical Archeology and Anthropology, Classical Archeology and Classics, Classical Humanities, Computer Science, Dramatic Art, Early Modern European Studies, East Asian Studies (China or Japan), Economics, Electrical Engineering, Elementary Education, English Literature, Environmental Studies, Fine Arts, French Language and Literature, Geodesy, Geography, Geology, Germanic Languages and Literatures, History, Human Kinetics and Leisure Studies, International Affairs, Journalism, Judaic Studies, Latin American Studies, Mathematical Statistics, Mathematics, Mechanical Engineering, Medical Technology, Middle School Education, Music (Applied, History and Literature, Theory), Nursing Anesthesia, Nurse Practitioner Program, Oceanography, Philosophy, Physician's Assistant Program, Physics, Political Science, Premedicine, Psychology, Public Affairs, Radiologic Sciences and Administration, Religion, Russian Language and Literature, Russian Literature and Culture—in Translation, Secondary Education, Sociology, Spanish American Literature, Spanish Language and Literature, Speech Communication and Broadcasting, Speech Pathology and Audiology, Urban Affairs, Zoology.

Study leading to graduate or professional degrees is offered in the Graduate School of Arts and Sciences, the National Law Center, the School of Medicine and Health Sciences, the School of Engineering and Applied Science, the School of Education and Human Development, the School of Government and Business Administration, and the School of Public and International Affairs.

THE GEORGE WASHINGTON UNIVERSITY

COLUMBIAN COLLEGE OF ARTS AND SCIENCES, 1821

THE GRADUATE SCHOOL OF ARTS AND SCIENCES, 1893

THE SCHOOL OF MEDICINE AND HEALTH SCIENCES, 1825

THE NATIONAL LAW CENTER, 1865

THE SCHOOL OF ENGINEERING AND APPLIED SCIENCE, 1884

THE SCHOOL OF EDUCATION AND HUMAN DEVELOPMENT, 1907

THE SCHOOL OF GOVERNMENT AND BUSINESS ADMINISTRATION, 1928

THE SCHOOL OF PUBLIC AND INTERNATIONAL AFFAIRS, 1928

THE DIVISION OF UNIVERSITY STUDENTS, 1930

THE COLLEGE OF GENERAL STUDIES, 1950

THE SUMMER SESSIONS, 1916

THE UNIVERSITY HOSPITAL, 1898

THE DIVISION OF EXPERIMENTAL PROGRAMS, 1973

ANNUAL ISSUES OF THE UNIVERSITY BULLETINS

Requests for the following publications must include your zip code and should be addressed to the office indicated, George Washington University, Washington, D.C. 20052

COLLEGE OF GENERAL STUDIES, Dean of the College

NATIONAL LAW CENTER, Admissions Office, National Law Center

SCHOOL OF ENGINEERING AND APPLIED SCIENCE, Dean of the School

UNDERGRADUATE AND GRADUATE PROGRAMS (Arts and Sciences, Education and Human Development, Government and Business Administration, Public and International Affairs), Admissions Office

SCHOOL OF MEDICINE AND HEALTH SCIENCES, Admissions Office, School of Medicine and Health Sciences

SCHEDULE OF CLASSES, FALL (Preregistration Edition), FALL (Revised Edition), and SPRING SEMESTERS, Registrar

SCHEDULE OF CLASSES, SUMMER SESSIONS, Dean of the Summer Sessions

INDEX

A

Abbreviations, key to, 52
Absence, regulations concerning, *see* Attendance
Academic dishonesty, 208
Academic status, 12
Academic work load, 21
Accident insurance, 220
Accreditation, E.C.P.D., 12
Acoustics, graduate field and area of concentration, 40, 71
Activities, student, 221–225
Administration:
  School of Engineering and Applied Science, 49
  University, 229
Administration of Research and Development, graduate field and area of concentration, 164
Admission:
  For international students, 15–18
  To doctoral study, 34, 138, 171, 187
  To Master's program, 27–29, 167, 183
Admission (cont'd.):
  To Professional degree programs, 32, 134, 136, 169, 186
  To undergraduate study, 12–19
Advanced placement examinations, credit for, 19
Advanced standing, 19–20
Advisory Council, 50
Advisory system, 21
Aeronautics, graduate field and area of concentration, 41, 72
Alumni associations, 215–216
Alumni career services, 220
Application for admission, 13, 27–28, 32, 34–35, 199
Application for graduation, 210–211
Applied Scientist, professional degree of, 31–34, 136–138, 168–171, 186
Applied Science courses, 53–54
  Graduate, 54
  Undergraduate, 53
Assistantships, 205–206
Athletics, 224
Attendance, 21, 30, 211
Awards, 202–205

B

Bachelor of Science study, 12–26, 58–70, 116–129, 180–182
Biochemistry courses, 192
Biological science courses, 192
Board of Trustees, 228
Bowie State College, Hampton Institute and Virginia Commonwealth University, undergraduate dual-degree program, 45–46

C

Calendar for 1979-80, 4
Career services, student and alumni, 220
Center for Academic and Administrative Computing, 213–214
Changes in program of study, 201–02, 209
Chemistry courses, 192–193
Civil Engineering:
  Courses:
    Graduate, 86–93
    Undergraduate, 63–65
  Undergraduate study, 58–65
Civil, Mechanical, and Environmental Engineering, 58–111
Civil, Mechanical, and Environmental Engineering (cont'd.):
  Courses:
    Graduate, 86–103
    Undergraduate, 63–65, 68–70
  Departmental staff, 58
  Graduate study, 70–86
  Undergraduate study, 58–68
Cloyd Heck Marvin Center, 219
College Entrance Examination Board Tests, 14, 19–20
College work-study program, 207
Colleges, schools, and divisions of the University, 245

Columbian College courses required for undergraduates, 192–196
Committees and organizations, University, 221
Communications:
  Graduate area of concentration, 130
  Undergraduate subject area, 117
  Student, 223
Computer Heuristics, Modeling, and Numerical Methods, graduate area of concentration, 131
Computer-oriented Civil Engineering option, undergraduate, 72
Computer-oriented Mechanical Engineering option, undergraduate, 67
Computer Science:
  Graduate area of concentration, 131
  Graduate courses, 154–159
  Undergraduate courses, 127–29
  Undergraduate option, electrical engineering field, 120
  Undergraduate subject area, 117
Conduct, 209
Consortium of Universities of the Washington Metropolitan Area, Inc., 197–98, 213
Construction Management, graduate field and area of concentration, 164–65
Continuing engineering education, 47–49
Continuing student, 197
Controls and Systems, undergraduate subject area, 117
Cooperative education program in engineering, 7, 42–45
Cooperative programs, 42–45
Counseling, 23, 220
Course numbers, explanation of, 51
Courses of instruction, 53–54, 63–65, 68–70, 86–111, 122–129, 142–159, 173–179, 187–191
Credit:
  From Baltimore Polytechnic Institute, 20
  From service schools, 20
  For advanced placement examinations, 19
  From technical institutes, 20
  Hours, explanation of, 51
  Hours, maximum allowed, 19
  Toward a degree, 210
  Transfer from other institutions, 20, 28, 33, 36, 210
Cultural and international exchange organizations, 223
Curricula, undergraduate, 24
  Civil Engineering, 62–65
  Electrical Engineering and Computer Science, 118–122
  Mechanical Engineering, 66–68

D

Davis-Hodgkins House, 221
Dean of Students Office, 217
Dean's Council, 50
Dean's Honors List, 23
Degree requirements, time to complete:
  Doctoral, 38
  Master's, 31
  Professional, 34
Degrees:
  Bachelor of Science, 22–26, 58–65, 65–70, 116–129
  Doctor of Science, 34–38, 70, 129, 171, 187
  Master of Engineering Administration, 27–31, 162–164
  Professional degrees, 31–34, 71, 129, 136–138, 168–171, 186
  Master of Science, 27–31, 70, 129–130, 135–136, 162–164, 183
Disabilities, services for students with, 217
Dishonesty, regulations concerning, 208
Dismissal of students, 212
Dissertation, 37
Distinction, degree earned with, 24
Doctoral program, *see* Graduate study
Dormitories, 217–218
Dropping courses, 201, 209
Drugs, University policy on, 212

E

Early admission plan, 14
Educational opportunity program, 219
Electrical Engineering and Computer Science, 116–159
  Courses:
    Graduate, 142–159

Electrical Engineering and Computer Science (cont'd):
Undergraduate, 122–127
Departmental staff, 116
Doctor of Science Program, 138–142
Graduate areas of concentration, 130–133
Graduate study, 129
Professional degree program, 136–138
Undergraduate study, 116–122
Electronics, undergraduate subject area, 117
Electrophysics (Electronics, Fields, and Waves), graduate area of concentration, 132
Emeritus faculty, 230
Employment, student, 209
Energy Conversion, Power, and Transmission, graduate area of concentration, 132
Energy, Resources, and Environment, graduate field and area of concentration, 73–74
Energy Resources and Power-oriented option, undergraduate, 68
Energy Systems, graduate area of concentration, 184
Engineer Alumni Association, 216
Engineer, professional degree of, 31–34, 71, 129, 136–138, 168–171, 186
Engineering Administration, 162–177
Courses:
Graduate, 173–177
Undergraduate, 173
Departmental staff, 162
Doctoral study, 171–73
Graduate field and area of concentration, 162
Engineering Administration (cont'd.):
Graduate areas of concentration, 16
166
Master of Engineering Administrati
degree program, 162–166
Master of Science degree program, 167–168
Professional degree program, 168–17
Engineering Science:
Graduate courses, 103–111
Undergraduate course, 70
Engineering, study of, 8–10
Engineers' Council, 222
English courses, 16–18, 193
English, use of correct, 23
Environmental and Water Resources Engineering, graduate field and area o
concentration, 74–76
Environmental modeling, graduate field and area of concentration, 41, 77
Environmental Management, graduate field and area of concentration, 165
Equal opportunity,
University policy on, 12
Examinations:
Advanced placement, 19
College Entrance Examination Board, 19
Doctoral, final, 37–38
Doctoral, qualifying, 36
For admission, 14, 199
Graduate Record, 27
Master's Comprehensive, 29
Placement, on entrance, 25
Test of English as a foreign language, 15–16

F

Faculty, 230–243
Fatigue, Fracture, and Structural Reliability, Institute for the Study of, 38
Fees, 198–202
Counseling Center, 220
Payment of, 200–201
Projected increases, 200
Reading Center, 214
Residence hall rates, 217–219
Speech and Hearing Clinic, 214
Fellowships, 205–206
Fields and Waves, undergraduate subject area, 118
Final examination, doctoral, 37–38
Financial aid, 202–209
Prepaid and deferred payment plans for parents, 201
Financial certificate, 16
Financial regulations, 198–202
Fluid Mechanics and Thermal Sciences, graduate field and area of concentration, 77–78
Food service, 218
Fraternities, 224
Freshman admission, 14

G

General Alumni Association, 215
General Operations Research, graduate area of concentration, 184
Geology course, 193
Geotechnical Civil Engineering option, 62
Geotechnical Engineering, graduate field and area of concentration, 78–79
Grades, 22, 30
Graduate Record Examination, 27
Graduate study, 27–38
  Doctoral, 34–38, 70, 129, 171, 187
  Master's, 27–31, 70, 129–130, 135–136, 162–64, 183
  Professional degrees, 31–34, 71, 129, 136–38, 168–71, 186
Graduation fees, 199
Graduation requirements, 23–24, 30–31, 33–34, 36, 199
Grants, 202–205
Guthridge apartment house, 219
GWU—NASA-Langley graduate program, 39

H

Hampton Institute, Bowie State College, and Virginia Commonwealth University, undergraduate dual-degree program, 45–46
Health and accident insurance, 220
Health service, student, 219
History of the school, 11
History of the University, 226–27
Hobbies organizations, 224
Honor societies, 222–23
Honorary Trustees, 229
Honors list, Dean's, 23
Honors, 24
Housing, 217–219
Humanities and social sciences, courses in, 25
Hydromechanics and Ocean Engineering, graduate field and area of concentration, 79–80

I

Information Systems Management, graduate field and area of concentration, 165
Institute for Management Science and Engineering, 39
Institute for the Study of Fatigue, Fracture, and Structural Reliability, 38
Insurance, health and accident, 220
International and cultural exchange organizations, 223
International House, 220
International students:
  Admission, 15
  Financial aid, 207
  International Students' Advising Office, 220
  Language test, 15

J

Joint Institute for Advancement of Flight Sciences, 40–41
Junior Year Abroad Program, 65–66

L

Laboratories and Measurement, undergraduate subject area, 118
Language requirements for doctoral study, 35
Language test for international students, 15–18
Leave of absence, 34, 38
Library, 211, 227
Loan funds, 206–207
Logistics Engineering, graduate area of concentration, 184
Lost and found office, 212

M

Major program events, student, 224
Management Science, graduate area of concentration, 184
Management Science and Engineering, Institute for, 39
Marketing of Technology, graduate field and area of concentration, 168
Marvin Center, 219
Master's comprehensive examination, 29
Master's programs, *see* Graduate study
Master's thesis, 29
Materials Science, graduate field, 41; *see also* Solid Mechanics and Materials Engineering
Mathematical Modeling in Information Systems, graduate area of concentration, 185
Mathematical Optimization, gradu area of concentration, 185
Mathematics courses, 193–195
Mechanical Engineering Courses:
  Graduate, 93–111
  Undergraduate, 68–70
  Undergraduate study, 65
Mechanical Engineering Design, gradu field and area of concentration, 80
Medical Engineering:
  Graduate area of concentration, 132
  Undergraduate subject area, 118
Mid-semester warning, 22
Milton apartment house, 219
Model Building for Transportation Flow graduate area of concentration, 185
Munson Hall apartments, 218

N

NASA-Langley graduate program, 39
Networks, undergraduate subject area, 118
Nondegree students, 47

O

Operations Research:
  Courses, 187–191
  Departmental staff, 180
  Doctoral study, 187
  Graduate areas of concentration, 184–86
  Master's study, 183
  Professional Degree Program, 186
Operations Research in Industrial Eng neering System, graduate area of con centration, 185
Optional Master's program without a the sis, 29
Organizations, student, 222

P

Pass-Fail Grading System, 30
Payment of fees, 200
Performing arts, 223
Physics courses, 195–196
Placement examinations, advanced, 19
Policy on release of student information, 211–212
Political organizations, 223
Post-admission transfer credit, 210
Premedical Engineering option, 121
Prizes, 209–210
Probation, 22–23
Professional degree program, *see* Graduate study
Professional organizations, 223
Program events, major student, 224
Programs of study and courses of instruction, 51–196
Programs, right to change, 212
Property, responsibility for, 212
Public Works Engineering, graduate field and area of concentration, 80–81
Publications, student, 223

Q

Qualifying examination, doctoral, 36
Quality-point index, 22
Quantitative Decision-making for Public Policy, graduate area of concentration 186

R

Reading Center, 214
Readmission, 18
Readmitted student, 197
Recreational organizations, 224
Refunds, 201–202
Registration, 28, 197
Regulations, 208–213
  Financial, 198–202
  For Bachelor's study, 21–24
  For Master's study, 30–31
Release of student information, policy on, 211–212
Religious life, 221
Religious organizations, 223–24
Research, doctoral, 37
Research scholar assistantships, 42
Residence halls, 217–19
Residence requirements:
  For Bachelor's degree, 24
  For Doctoral degree, 38
  For Master's degree, 31
  For Professional degrees, 34
ROTC, 215
Rules, right to change, 212

S

Scholarship requirements, 22, 30, 33, 36, 170
Scholarships, 203–205
Service school credit, 20
Service organizations, student, 224
Services for students with disabilities, 217
Social sciences, courses in, 25
Solid Mechanics and Materials Engineering, graduate field and area of concentration, 81–82
Sororities, 224
Special honors, 24
Special interest and advocate groups, student, 224
Special programs, 38–46
Speech and Hearing Clinic, 214
Sports organizations, 224
Staff of instruction, 230–243
Stochastic Modeling, graduate area of concentration, 186
Structural Engineering, graduate field and area of concentration, 82–83
Structures and Dynamics, graduate field and area of concentration, 83
Student activities, 221
  Office, 221
Student and Alumni Career Services, 220
Student government, 222
Student health service, 219
Student information, policy on release of, 211–212
Student life, 216
Student organizations, 222–24
Student services, 217
Suspension, 23
Systems Analysis and Management, graduate field and area of concentration, 167
Systems Science, Networks, and Controls, graduate area of concentration, 133

T

Technical institutes, credit from, 20
Technology and Public Affairs, graduate field and area of concentration, 168
Thermal Sciences, *see* Fluid Mechanics and Thermal Sciences
Thesis, Master's, 29
  Optional Master's program, without a, 29
Time of course offerings, 51
Time to complete degree requirements:
  Doctoral, 38, 172
  Master's, 31
  Professional, 34, 170
Tool requirement for doctoral study, 35
Transcripts of record, 13–15, 28, 199, 210
Transfer credit, 19–20, 28, 33, 36, 169, 171, 210
Transfer students, 14–15
Transportation Engineering, graduate field and area of concentration, 84
Transportation Management, graduate field and area of concentration, 166
Trustees, Board of, 228
Tuition:
  Advanced Deposit, 18
  Fees, 198
  Projected increases, 200

U

Undergraduate study, 12–26, 58–70, 116–129
University Center fee, 198–99
University committees and organizatio 221
University Counseling Center, 220

V

Veterans Benefits, 214
Virginia Commonwealth University, Hampton Institute, and Bowie State College, undergraduate dual-degree program, 45–46
Vocational counseling, 220

W

Warning, mid-semester, 22
Withdrawal, 201, 209
Work load, academic, 21
Work-study program, college, 207

COLLEGES AND SCHOOLS—DEGREE PROGRAMS

COLUMBIAN COLLEGE OF ARTS AND SCIENCES: Associate in Arts (A.A.), Associate in Arts in General Studies (A.A. in Gen.Std.), Associate in Science in Cartographic Science (A.S. in Cart.Sc.), Associate in Science in Geodesy (A.S. in Geod.), Bachelor of Arts (B.A.), Bachelor of General Studies (B.Gen.Std.), Bachelor of Science (B.S.), Bachelor of Science in Cartographic Science (B.S. in Cart. Sc.), Bachelor of Science in Geodesy (B.S. in Geod.), and Bachelor of Science in Oceanography (B.S. in Ocea.)

GRADUATE SCHOOL OF ARTS AND SCIENCES: Master of Arts (M.A.), Master of Arts in Special Studies (M.A. in Sp.Std.), Master of Fine Arts (M.F.A.), Master of Forensic Sciences (M.F.S.), Master of Music (Mus.M.), Master of Science (M.S.), Master of Science for Teachers (M.S. for Teachers), Master of Science in Forensic Science (M.S.F.S.), Master of Science in Special Studies (M.S. in Sp.Std.), and Doctor of Philosophy (Ph.D.)

SCHOOL OF MEDICINE AND HEALTH SCIENCES: Associate in Science (A.S.), Bachelor of Science (B.S.), Bachelor of Science in Health Science (B.S. in H.Sc.), and Doctor of Medicine (M.D.)

NATIONAL LAW CENTER: Juris Doctor (J.D.), Master of Laws (LL.M.), Master of Comparative Law (M.Comp.L.), Master of Comparative Law (American Practice) (M.Comp.L. [Am.Prac.]), and Doctor of Juridical Science (S.J.D.)

SCHOOL OF ENGINEERING AND APPLIED SCIENCE: Bachelor of Science (Civil Engineering) (B.S. [C.E.]), Bachelor of Science (Electrical Engineering) (B.S. [E.E.]), Bachelor of Science (Mechanical Engineering) (B.S. [M.E.]), Master of Engineering Administration (M.E.A.), Master of Science (M.S.), Doctor of Science (D.Sc), Engineer (Engr.), and Applied Scientist (App.Sc.)

SCHOOL OF EDUCATION AND HUMAN DEVELOPMENT: Bachelor of Arts in Education (B.A. in Ed.), Bachelor of Science in Human Kinetics and Leisure Studies (B.S. in H.K.L.S.), Master of Arts in Education (M.A. in Ed.), Master of Arts in Teaching (M.A.T.), Education Specialist (Ed.S.), and Doctor of Education (Ed.D.)

SCHOOL OF GOVERNMENT AND BUSINESS ADMINISTRATION: Bachelor of Business Administration (B.B.A.), Bachelor of Science in Administration (B.S. in Adm.), Bachelor of Science in Health Care Administration (B.S. in H.C.A.), Master of Accounting (M.Acct.), Master of Arts in Health Care Administration (M.A. in H.C.A.), Master of Business Administration (M.B.A.), Master of Public Administration (M.P.A.), Master of Science in Administration (M.S. in Adm.), Master of Urban and Regional Planning (M. of Urb. and Reg. Plan.), Post-Master's Graduate Certificate in Health Care Administration (Grad.Cert in H.C.A.), Doctor of Business Administration (D.B.A.), and Doctor of Public Administration (D.P.A.)

SCHOOL OF PUBLIC AND INTERNATIONAL AFFAIRS: Bachelor of Arts (B.A.), Master of Arts (M.A.), and Master of Science in International Affairs (M.S.I.A.)











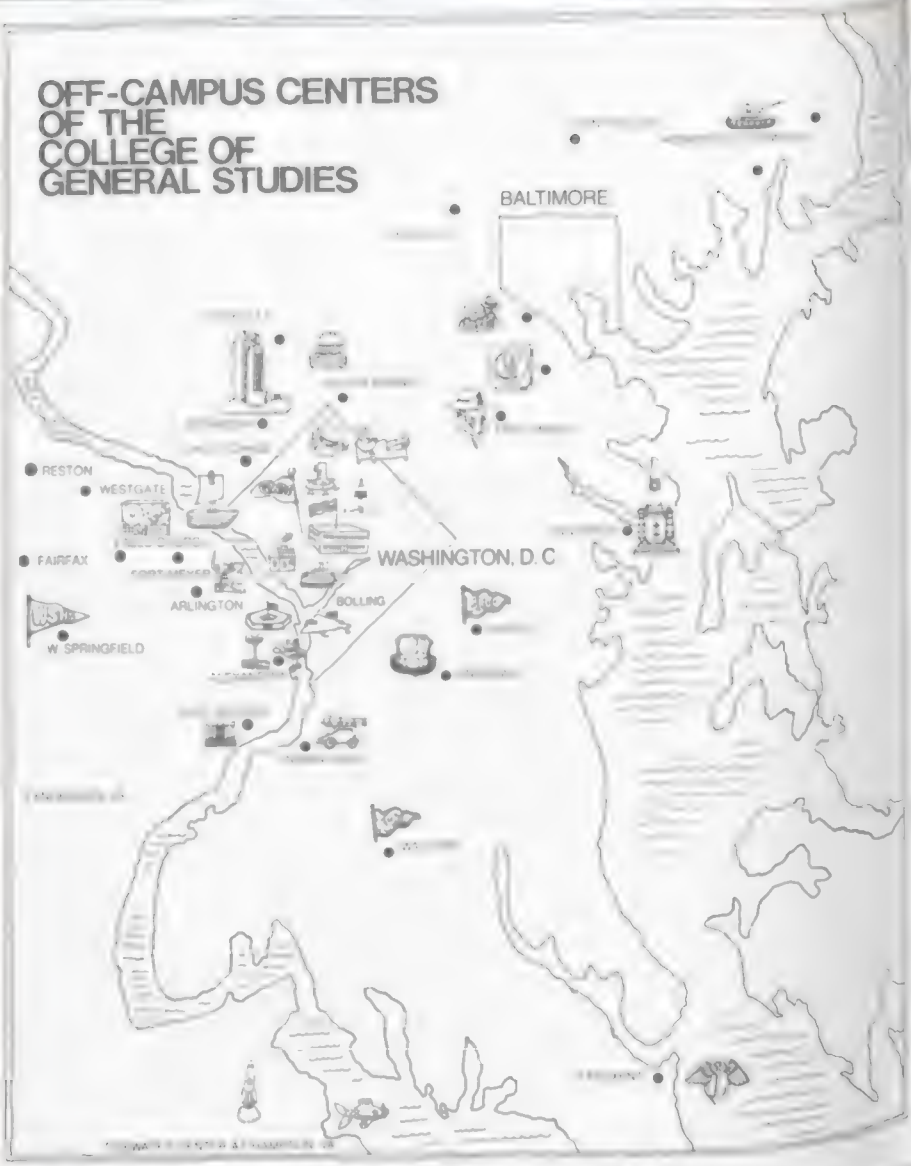
THE GEORGE WASHINGTON UNIVERSITY CAMPUS / WASHINGTON, D.C.





HE GEORGE WASHINGTON UNIVERSITY BULLETIN
LXXVIII, No. 4, July, 1979

OLLEGE OF GENERAL STUDIES
79–1980



OFF-CAMPUS LOCATIONS OF THE COLLEGE OF GENERAL STUDIES

THE GEORGE WASHINGTON UNIVERSITY BULLETIN
(USPS 343-070)
Volume LXXVIII, Number 4, July, 1979

Published by The University at Washington, D.C. 20052

SIX TIMES PER YEAR: MARCH, APRIL, MAY,
JULY, AUGUST, AND DECEMBER

Second Class Postage Paid at Washington, D.C.

THE GEORGE WASHINGTON UNIVERSITY BULLETIN

THE COLLEGE OF GENERAL STUDIES

1979–1980

WASHINGTON, D.C. 20052



CONTENTS

Page

4 The Calendar

6 The University
6 History
7 The Colleges, Schools, and Divisions
8 Academic Status
9 University Policy on Equal Opportunity
9 Services for Students with Disabilities
10 Location
10 The General Alumni Association
10 The Board of Trustees
12 Officers of Administration

14 College of General Studies
16 Admission
23 Registration
23 Fees and Financial Regulations
29 Regulations
36 Student Services
41 Continuing Education for Women Center

44 Columbian College of Arts and Sciences

55 Graduate School of Arts and Sciences

60 School of Engineering and Applied Science

66 School of Education and Human Development

69 School of Government and Business Administration

70 Off-campus Locations of the College of General Studies

83 Courses of Instruction

155 Index

THE CALENDAR 1979–80*

1979 1980

AUGUST

S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

SEPTEMBER

S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30						

OCTOBER

S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

NOVEMBER

S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	

DECEMBER

S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

JANUARY

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

FEBRUARY

S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	

MARCH

S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

APRIL

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30			

MAY

S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

JUNE

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30					

JULY

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

1979 FALL SEMESTER

August 13–September 4	Off-campus registration† (days of registration and beginning classes will be announced in the *Off-Campus Schedule of Classes*)
	Application for February graduation due as part of registration
August 30–September 1	Registration on campus† *Thursday–Saturday*
	Application for February graduation due as part of registration
September 3	Labor Day (holiday) *Monday*
September 4	On-campus classes begin *Tuesday*
September 10	Off-campus classes begin *Monday*
October 8	Columbus Day—no off-campus classes *Monday*

* Off-Campus courses organized at any time. The Academic Calendar is subject to change.

† Hours of registration will be announced in the *Schedule of Classes*. Application for Master's Comprehensive Examinations is the student's responsibility and must be made when registering for last courses required for degree

November 9	M.S. in Administration Field Examinations *Friday*
November 16	D.Sc. dissertations of February candidates due *Friday*
November 21	Thanksgiving recess begins after last class *Wednesday*
November 26	Classes resume *Monday*
November 30	School of Engineering and Applied Science Master's theses of February candidates due *Friday*
December 4	Last day of campus classes *Tuesday*
December 8	Ed.S., and M.A. in Education Comprehensive Examinations *Saturday*
December 11–20	Campus examination period *Tuesday–Thursday*
December 21	Last day of off-campus classes *Friday*
January 3	Master's Theses (other than those in the School of Engineering and Applied Science) of February candidates due *Wednesday*

1980 SPRING SEMESTER

January 2–14	Off-campus registration* (days of registration and beginning classes will be announced in the *Off-Campus Schedule of Classes*) Application for May graduation due as part of registration
January 10–12	Registration on campus* *Thursday–Saturday* Application for May graduation due as part of registration
January 14	On-campus classes begin *Monday*
January 21	Off-campus classes begin *Monday*
February 18	Winter Convocation (holiday) *Monday*
March 21	D.Sc. dissertations of May candidates due *Friday*
April 4	School of Engineering and Applied Science Master's theses of May candidates due *Friday*
April 11	M.S. in Administration Field Examinations *Friday*
April 14	Master's Theses (other than those in the School of Engineering and Applied Science) of May candidates due *Monday*
April 18	Last day of campus classes *Friday*
April 19	Ed.S. and M.A. in Education Comprehensive Examinations *Saturday*
April 24–May 3	Campus examination period *Thursday–Saturday*
April 28	Last day of off-campus classes *Monday*
May 4	Commencement *Sunday*

1980 SUMMER SESSIONS

There are two seven-week sessions and one fourteen-week session. Days of registration and beginning classes will be announced in the *Off-Campus Schedule of Classes.*

* Hours of registration will be announced in the *Schedule of Classes.* Application for Master's Comprehensive Examinations is the student's responsibility and must be made when registering for last courses required for degree.

THE UNIVERSITY

HISTORY

GEORGE WASHINGTON UNIVERSITY had its beginning in 1821 as The Columbia College in the District of Columbia. The name of the institution was change in 1873 to Columbian University and in 1904 to The George Washington University. The debt of the University to George Washington, whose name bears, is an intangible one.

George Washington, as President and as private citizen, had urgently insiste upon the establishment of a National University in the federal city. There he hoped that, while being instructed in the arts and sciences, students from a parts of the country would acquire the habits of good citizenship, throwing o local prejudices and gaining at first hand a knowledge of the practice, as we as the theory of republican government. To further the materialization of h hopes, Washington left a bequest of fifty shares of The Potomac Compan "towards the endowment of a University to be established within the limits the District of Columbia, under the auspices of the General Government, that government should incline to extend a fostering hand towards it." Th Congress never extended "a fostering hand." The Potomac Company passe out of existence, and Washington's bequest became worthless.

Fully conscious of Washington's hopes, but motivated primarily by a gre missionary urge and the need for a learned clergy, a group of dedicated min isters and laymen sponsored a movement for the establishment of a college the District of Columbia. Inspired largely by the zeal and energy of the Re erend Luther Rice, they raised funds for the purchase of a site and petitione Congress for a charter. After much delay and amendment, Congress granted charter which was approved by President Monroe on February 9, 1821. To safe guard the College's nonsectarian character it provided "That persons of every religious denomination shall be capable of being elected Trustees; nor shall any person, either as President, Professor, Tutor or pupil, be refused admittance into said College, or denied any of the privileges, immunities, or advantages thereof, for or on account of his sentiments in matters of religion."

During the entire time when the institution was known as Columbian College its activities were centered on College Hill, a tract of forty-six and a half acres between the present Fourteenth and Fifteenth Streets extending north from Florida Avenue to somewhat beyond Columbia Road. The Medical School was located downtown. For the better part of the Columbian University period the buildings of the University were situated along H Street between Thirteenth and Fifteenth Streets.

During the last half century the University's present plant has been developed in that section of the old First Ward familiarly known as "Foggy Bottom" between Nineteenth and Twenty-fourth Streets, south of Pennsylvania Avenue. The area has many reminders of historic interest to the University. President

Monroe, who signed the charter, lived at 2017 Eye Street. The first President of the Board of Trustees, the Reverend Obadiah B. Brown, was for fifty years the pastor of a church at Nineteenth and Eye Streets, and Washington selected Twenty-third and F Streets as the site of the National University he had hoped to see established.

THE COLLEGES, SCHOOLS, AND DIVISIONS

George Washington University includes 12 colleges, schools, and divisions, as follows:

*Columbian College of Arts and Sciences** offers four-year programs in the arts and sciences leading to the degrees of Bachelor of Arts and Bachelor of Science. The College also provides prelegal and premedical programs, and the preprofessional work required for admission to the School of Public and International Affairs. Columbian College has academic jurisdiction over the off-campus programs leading to the degrees of Associate in Arts in General Studies, Associate in Science in Cartographic Science, Associate in Science in Geodesy, Bachelor of General Studies, Bachelor of Science in Geodesy, Bachelor of Science in Cartographic Science, and Bachelor of Science in Oceanography. These off-campus programs are administered by the College of General Studies.

The Graduate School of Arts and Sciences†‡ offers advanced study and research leading to the degrees of Master of Arts, Master of Arts in Special Studies, Master of Fine Arts, Master of Forensic Sciences, Master of Music, Master of Science, Master of Science in Forensic Science, Master of Science in Special Studies, Master of Science for Teachers, and Doctor of Philosophy. The degrees of Master of Arts in Special Studies and Master of Science in Special Studies are also available through off-campus programs administered by the College of General Studies.

The School of Medicine and Health Sciences†‡ offers work leading to the degrees of Associate in Science, Bachelor of Science, and Doctor of Medicine.

The National Law Center‡ offers courses leading to the degrees of Juris Doctor, Master of Laws, Master of Comparative Law, Master of Comparative Law (American Practice), and Doctor of Juridical Science; and special programs in Continuing Legal Education.

The School of Engineering and Applied Science offers courses leading to the degree of Bachelor of Science in the following areas: civil engineering, electrical engineering, and mechanical engineering. Graduate programs lead to the degrees of Master of Science, Master of Engineering Administration, Engineer, Applied Scientist, and Doctor of Science. The School has academic jurisdiction over the off-campus programs leading to the degrees of Master of Science, Master of Engineering Administration, and Doctor of Science. These off-campus programs are administered by the College of General Studies.

---

* Columbian College of Arts and Sciences cooperates with the School of Medicine and Health Sciences in offering a program leading to the combined degrees of Bachelor of Arts and Doctor of Medicine.

† The Graduate School of Arts and Sciences cooperates with the School of Medicine and Health Sciences in offering a program leading to the combined degrees of Master of Science and Doctor of Medicine and a dual program leading to the degrees of Doctor of Medicine and Doctor of Philosophy.

‡ The National Law Center cooperates with the School of Public and International Affairs, the Graduate School of Arts and Sciences, and the School of Government and Business Administration in offering a program leading to the combined degrees of Juris Doctor and Master of Arts.

The School of Education and Human Development offers undergraduate pro-
grams leading to the degrees of Bachelor of Arts in Education and Bachelor
Science in Human Kinetics and Leisure Studies; graduate studies leading to
degrees of Master of Arts in Education, Master of Arts in Teaching, Educa
Specialist, and Doctor of Education. The degree of Master of Arts in Educa
is also available through off-campus programs administered by the College
General Studies.

*The School of Government and Business Administration** offers undergra
ate programs leading to the degrees of Bachelor of Business Administration
Bachelor of Science in Health Care Administration; graduate programs lea
to the degrees of Master of Accounting, Master of Arts in Health Care
ministration, Master of Business Administration, Master of Public Admin
tion, Master of Urban and Regional Planning, the Post master's Graduate C
tificate in Health Care Administration; the degrees of Doctor of Busi
Administration and Doctor of Public Administration.

*The School of Public and International Affairs** offers undergraduate pro-
grams leading to the degree of Bachelor of Arts and graduate programs lea
to the degree of Master of Arts. The School also offers an off-campus pro
gram leading to the degree of Master of Science in International Affairs.

The College of General Studies supplements the adult education progra
the University through campus and off-campus study; conferences, semi
and special projects; and continuing education and noncredit programs. T
College also administers the off-campus programs over which Columbian C
lege of Arts and Sciences, the Graduate School of Arts and Sciences, t
School of Engineering and Applied Science, the School of Education, and t
School of Government and Business Administration have academic jurisdictio

The Division of University Students makes available courses for students
candidates for degrees in this University.

The Division of Experimental Programs supports University-wide curricula
experimentation and development, especially the development of new cou
and new programs that entail interdisciplinary or interschool cooperation
that utilize educational resources in the Washington community.

The Summer Sessions.

ACADEMIC STATUS

George Washington University is accredited by its regional accrediting agency
the Middle States Association of Colleges and Secondary Schools.

The University is on the approved list of the American Association of U
versity Women and is a member of the College Entrance Examination Board

The National Law Center is a charter member of the Association of Amer
can Law Schools and is approved by the Section of Legal Education and Ad
missions to the Bar of the American Bar Association.

The School of Medicine and Health Sciences is a member of the Associa
tion of American Medical Colleges and is one of the medical colleges which
has been continuously approved by the American Medical Association.

Undergraduate curricula of the School of Engineering and Applied Science
civil, electrical, and mechanical engineering are accredited by the Engineers
Council for Professional Development. The School of Education and Human

* The National Law Center cooperates with the School of Public and International Affairs,
Graduate School of Arts and Sciences, and the School of Government and Business Administration
offering a program leading to the combined degrees of Juris Doctor and Master of Arts

Development is a charter member of the American Association of Colleges for Teacher Education and is accredited by the National Council for Accreditation of Teacher Education for its bachelor's and master's degree programs. The School of Government and Business Administration has maintained full membership in the Middle Atlantic Association of Colleges of Business Administration since 1961. It joined the Council on Graduate Education for Public Administration in 1966. In 1968, the School became a member of the American Assembly of Collegiate Schools of Business, and, in 1977, its undergraduate programs were accredited by the Assembly. The programs in accounting satisfy the educational requirements for the Certified Public Accountant and the Certified Management Accountant professional examinations. The program in hospital administration is accredited by the National Accrediting Commission on Graduate Education for Hospital Administration. The Master of Urban and Regional Planning degree program is recognized by the American Institute of Planners. The Department of Chemistry is on the approved list of the American Chemical Society. The graduate program in clinical psychology in the Department of Psychology is on the approved list of the American Psychological Association. The program in speech pathology and audiology is accredited by the Education and Training Board of the American Boards of Examiners in Speech Pathology and Audiology.

UNIVERSITY POLICY ON EQUAL OPPORTUNITY

George Washington University does not discriminate against any person on the basis of sex, race, color, religion, national origin, or handicap in any of its education programs or activities. Federal regulations implementing Title IX of the Education Amendments of 1972 and the Rehabilitation Act of 1973 call for an explicit statement that the requirement not to discriminate on the basis of sex or handicap extends to employment in and admission to such programs and activities. The University is also subject to the District of Columbia Human Rights Law.

Inquiries concerning the application of this policy and federal laws and regulations concerning discrimination in education or employment programs and activities may be addressed to Marianne Phelps, Assistant Provost for Affirmative Action, Rice Hall, Washington, D.C. 20052, or to the Director of the Office for Civil Rights of the Department of Health, Education, and Welfare.

SERVICES FOR STUDENTS WITH DISABILITIES

In order to insure that disabled students may have access to George Washington University's many off-campus classes, all facilities that are accessible by wheelchair have been identified. Should a student find that registration has been completed for one of the few facilities that cannot accommodate a wheelchair at that time, the Director of Counseling and Student Services should be contacted at 676-7000 and arrangements will be made to register the student for a class at a location with adequate facilities.

For students with other types of disabilities, the University will insure that any auxiliary aids necessary for students to profit from their educational experience are available. Students who are having difficulty in securing necessary auxiliary aids, should contact the Director of Counseling and Student Services 676-7000.

Occasionally teaching methods and curriculums may have to be modified to meet a particular set of circumstances. The faculty have been advised of this requirement and are prepared to meet needs as they are identified. Modification of standards, however, is inappropriate and will not be attempted.

Any disabled student desiring to register for an off-campus course of the George Washington University and needing additional information, should call the Director of Counseling and Student Services at (202) 676-7000.

LOCATION

The University is in downtown Washington, between Pennsylvania Avenue and 19th, F, and 24th Streets, N.W. In immediately adjacent areas are the White House, the World Bank, the Corcoran Gallery of Art, the Department of State, the National Academy of Sciences, the John F. Kennedy Center for the Performing Arts, and many other governmental and cultural institutions.

THE GENERAL ALUMNI ASSOCIATION

The objectives of this Association are to unite the graduates who wish to associate themselves for charitable, educational, literary, and scientific purposes and to promote the general welfare of the University.

Eligible members are those who have enrolled in any school of the University and who have left the University in good standing, or any person who is or has been a member of the teaching, research, or administrative staff of the University, or of the Board of Trustees of the University. Active members are those who are life members of the George Washington University General Alumni Association or the Alumni Association of any school of the University, or are current contributors to the George Washington University Fund.

The Office is located in Alumni House, 714 21st Street, N.W., George Washington University, Washington, D.C. 20052.

All alumni are urged to keep the Alumni Office informed of changes of address or occupation and to supply information with regard to their fellow alumni.

THE BOARD OF TRUSTEES

The University is privately endowed and is governed by a Board of Trustees of which the President of the University is an *ex officio* member.

E.K. Morris, LL.D., D.P.S., *Chairman Emeritus*
Charles E. Phillips, LL.B., LL.M., *Chairman Emeritus*

Glen A. Wilkinson, B.S., J.D., *Chairman*
Everett H. Bellows, M.A., *Vice Chairman*
James M. Mitchell, M.A., *Secretary*
Thaddeus A. Lindner, B.A. in Govt., *Assistant Secretary*

George M. Bunker, B.S.
Mortimer M. Caplin B.S., LL.B., J.S.D., LL.D.
*Lyn Henderson Clark, B.A.
Henry C. Clausen, J.D.
Jacqueline Cochran, L.H.D., LL.D., Sc.D.

* Alumni trustee.

Donald C. Cook, B.A., M.B.A., J.D., LL.M., L.H.D., LL.D.
L. Stanley Crane, B.S.
*Joseph B. Danzansky, B.A., J.D.
Nancy B. Dudley, B.A. in Govt.
John B. Duncan, B.A., LL.B., LL.D.
Morton I. Funger, B.A.
Katharine Graham, B.A.
Edwin K. Hoffman, B.S.
Joseph D. Hughes, B.S., J.D., LL.M., LL.D.
L.A. Jennings
David M. Kennedy, LL.B., B.A., LL.D.
Melvin R. Laird, B.A., L.H.D., LL.D., D.Pol.S.
*Sidney A. Levine, B.A., M.D.
Franklin J. Lunding, LL.B., LL.D.
Jeremiah Milbank, B.A., M.B.A.
Thornton W. Owen, B.S. in C.E., B.A.
Flaxie M. Pinkett, B.A.
*Abe Pollin, B.A. in Govt.
S. Dillon Ripley II, Ph.D., L.H.D., Sc.D.
Orville F. Rush, J.D., LL.D.
John T. Sapienza, B.A., LL.B.
Carleton D. Smith
Douglas R. Smith, B.S.C.
Robert H. Smith, B.A.
Carleton M. Stewart, M.B.A.
Mark Sullivan, Jr., B.A.
John W. Thompson, Jr., B.A.
Robert L. Tull, B.A.
William G. White, B.S. in C.E
Stephen R. Woodzell, B.S. in E.E.
James O. Wright, B.S., J.D.
*Joseph S. Wright, LL.B., LL.D.

HONORARY TRUSTEES

Jacob Burns, LL.B., LL.D.
George A. Butler, LL.B.
Harry F. Duncan
Newell W. Ellison, B.A., LL.B., LL.D.
Melville B. Grosvenor, B.S., Sc.D., LL.D.
Brooks Hays, B.A., J.D., LL.D., L.H.D., D.C.L., D.D., HH.D.
Joseph H. Hirshhorn
John K. McKee
E.K. Morris, LL.D., D.P.S.
Godfrey L. Munter, B.A., LL.B., LL.D.
Charles E. Phillips, LL.B., LL.M.
Charles E. Smith
John J. Wilson, LL.B., LL.D.
Lloyd B. Wilson
Watson W. Wise, Ph.B., Litt.D.

* Alumni trustee.

OFFICERS OF ADMINISTRATION*

The University

Lloyd Hartman Elliott, M.A., Ed.D., LL.D., *President*
Harold Frederick Bright, Ph.D., *Provost and Vice President for Academic Affairs*
Seymour Alpert, B.A., M.D., *Vice President for Development*
Charles Edward Diehl, B.Arch.Engr., B.C.E., M.B.A., *Vice President and Treasurer*
William David Johnson, B.S., *Director of Planning and Budgeting*
Ronald Paul Kaufman, B.S., M.D., *Vice President for Medical Affairs*
Carl James Lange, Ph.D., *Vice President for Administration and Research*
John Herbert Strandquist, *Assistant Vice President for Employee Relations*
Louis Harkey Mayo, B.S., J.S.D., *Vice President for Policy Studies and Special Projects*
Frederick Justin Naramore, B.S., C.P.A., *Comptroller*
William Parkhurst Smith, Jr., B.A., M.B.A., M.A. in Ed., *Vice President for Student Affairs*
Robert Gebhardtsbauer, B.A., M.A., *Registrar*
Joseph Young Ruth, B.A., *Director of Admissions*

College of General Studies

Robert Lee Holland, Ph.D., *Dean of the College of General Studies*
Alvin Carl Jensen, Ed.D., *Associate Dean of the College of General Studies*
Billie Jo Moreland, Ed.D., *Assistant Dean of the College of General Studies*
James Noel, Ed.D., *Assistant Dean of the College of General Studies*
Ruth H. Osborn, Ed.D., *Assistant Dean of the College of General Studies*

Columbian College of Arts and Sciences

Calvin Darlington Linton, Ph.D., *Dean of Columbian College of Arts and Sciences*
Barbara Joan Dunham, M.A., *Assistant Dean of Columbian College of Arts and Sciences*
Joseph Louis Métivier, Jr., M.A., *Assistant Dean of Columbian College of Arts and Sciences*
Robert Clinton Rutledge, Ph.D., *Assistant Dean of Columbian College of Arts and Sciences*
Robert Earle Knowlton, Ph.D., *Assistant Dean of Columbian College of Arts and Sciences*

Graduate School of Arts and Sciences

Henry Solomon, Ph.D., *Dean of the Graduate School of Arts and Sciences*
Avery Delano Andrews, Ph.D., *Assistant Dean of the Graduate School of Arts and Sciences*

* The President of the University, the Vice President for Academic Affairs, the Registrar of the University, the Director of Admissions of the University, and the University Librarian are *ex officio* members of all faculties of the colleges and schools of the University.

Edward Alan Caress, Ph.D., *Assistant Dean of the Graduate School of Arts and Sciences*
Charles Edward Rice, Ph.D., *Assistant Dean of the Graduate School of Arts and Sciences*
David Alton Rowley, Ph.D., *Assistant Dean of the Graduate School of Arts and Sciences*

National Law Center

Jerome Aure Barron, B.A., LL.B., LL.M., *Dean of the National Law Center*
Edward Andrew Potts, B.A., LL.B., *Associate Dean of the National Law Center for Graduate Studies, Research, and Projects*

School of Education and Human Development

Robert Edward Baker, M.A., Ed.D., *Acting Dean of the School of Education and Human Development*
Perry Botwin, Ed.D., *Acting Assistant Dean of the School of Education and Human Development*

School of Engineering and Applied Science

Harold Liebowitz, D.Ae.E., *Dean of the School of Engineering and Applied Science*
James Elmer Feir, Ph.D., *Associate Dean of the School of Engineering and Applied Science*

School of Government and Business Administration

Norma Maine Loeser, B.A., M.B.A., D.B.A., *Dean of the School of Government and Business Administration*
Leon Gintzig, B.S., M.S., Ph.D., *Associate Dean for Academic Affairs of the School of Government and Business Administration*
John Lobuts, Jr., B.S., Ed.D., *Assistant Dean of the School of Government and Business Administration*
David Francis Bergwall, B.S., M.B.A., D.B.A., *Assistant Dean of the School of Government and Business Administration*

School of Medicine and Health Sciences

Philip Stanley Birnbaum, M.S. in M.E., B.C.E., *Dean for Administrative Affairs of the Medical Center*
Lawrence Thompson Bowles, M.D., Ph.D., *Dean for Academic Affairs of the Medical Center*
Dennis Sophian O'Leary, B.A., M.D., *Dean for Clinical Affairs of the Medical Center*

School of Public and International Affairs

Burton Malcolm Sapin, Ph.D., *Dean of the School of Public and International Affairs*

COLLEGE OF GENERAL STUDIES

Dean R.L. Holland
Associate Dean A.C. Jensen
Assistant Deans B.J. Moreland, J. Noel, and R.H. Osborn

INTRODUCTION

The College of General Studies, the off-campus division of George Washington University, was established in 1950 to extend the educational resources of the University to the community. The College continues in expanding the University's activities by providing academic programs for adult students and by helping to meet the continuing educational requirements of the National Capital area.

The College offers off-campus credit courses for the nondegree student, whether for personal enrichment or for updating or upgrading professional credentials. Off-campus degree programs, administered by the College of General Studies for other colleges and schools of the University, are offered at the undergraduate and graduate levels for students who wish to pursue a major formal program of study. Experimental pilot programs of study are developed in cooperation with other colleges and schools of the University in response to specific needs of the government and business community. The College also develops and conducts noncredit courses, seminars, and workshops drawing on the resources of the University.

The staff of instruction for the off-campus programs includes members of the full-time faculty of the University and academically qualified part-time lecturers from the Washington professional community.

The College works closely with education directors, public school officials, and personnel administrators in government, business, and industry to develop courses of study and expand the educational opportunities for the mature student. In cooperation with these sponsoring groups the College offers courses at off-campus centers throughout the District of Columbia and in nearby Maryland and northern Virginia. A center is also located at Hampton, Virginia, serving the Tidewater area. Government agencies and installations, business organizations, or professional groups interested in having the College organize and conduct a course or a comprehensive educational program should contact the Associate Dean of the College of General Studies.

The academic standards of the University are maintained in off-campus credit courses. The College of General Studies is accredited by its regional accrediting agency, the Middle States Association of Colleges and Secondary Schools. All programs offered through the University's off-campus program administered by the College of General Studies, are approved through the regular University procedure authorized by the Board of Trustees and the Charter granted by the Congress of the United States. Degrees are granted through the faculties of the degree granting schools and colleges of the University. Credit earned through off-campus study conforms to the academic standards throughout the University.

DEGREE PROGRAMS

Columbian College of Arts and Sciences offers the following degrees off campus:

Associate in Arts in General Studies
Associate in Science in Cartographic Science
Associate in Science in Geodesy
Bachelor of General Studies
Bachelor of Science in Cartographic Science
Bachelor of Science in Geodesy
Bachelor of Science in Oceanography

The Graduate School of Arts and Sciences offers the following degrees off campus:

Master of Arts in Special Studies
Master of Science in Special Studies

The School of Engineering and Applied Science offers the following degrees off campus:

Master of Engineering Administration
Master of Science
Professional Degrees
Doctor of Science

The School of Education and Human Development offers the following degrees off campus:

Master of Arts in Education
Education Specialist

SPECIAL PROGRAMS

SPECIAL CREDIT PROGRAMS

Special credit courses and programs designed to meet the needs of interested individuals, groups, and agencies are offered in the liberal arts, education, and other areas. From time to time such offerings include foreign-tour programs and other programs of a continuing education nature. For further information contact one of the persons listed below.

SPECIAL NONDEGREE PROGRAMS

Noncredit courses, conferences, seminars, and institutes are offered to meet the needs of individuals and groups. They are designed for business, industry and professional groups. Noncredit courses include such topics as: Agricultural Taiwan, Communication for Managers, Digital Telecommunications, Developmental Mathematics, English as a Foreign Language, Elements of PERT-CPM Techniques, Financial Statement Analysis, Financial Evaluation of Projects and Investment Opportunities, Forensic Crime Scene Technician Program, International Transactions— Commercial and Legal Aspects, Intensive Beginning Russian, Introduction to Electronic Data Processing, Management by Objectives, Management Applications of Behavioral Science, Politics of Management, Radio Spectrum Management, Starting Your Own Business, and Zero Base Budgeting.

For information on Continuing Education for Women Programs, see page 41.

For information on programs in specific geographic areas, contact I. Ralph DeBelles, Manager of District of Columbia Programs, telephone 676-7[illegible]; Douglas Carter, Manager of Maryland Programs, telephone 676-7022; Ross Lloyd, Jr., Manager of Virginia Programs, telephone 676-7040; E. Frank Dolong, Manager of Education Programs, Tidewater Center, telephone (80[illegible] 838-8444.

Admission

NONDEGREE STUDENTS

Off-campus credit courses may be taken by nondegree students who meet the prerequisites prescribed by the department concerned. A student who has been dismissed or required to withdraw from this or another institution is not eligible to register for at least one fall or one spring semester from the date of such action. Formal University admission is not required for registration.

Nondegree students wishing to enroll in graduate courses other than those offered by the School of Government and Business Administration must have completed a bachelor's degree or have completed 90 semester hours of undergraduate work and they must have the permission of the instructor. Nondegree students who wish to enroll in graduate courses offered by the School of Government and Business Administration must have completed a bachelor's degree.

Credits earned as a nondegree student may later be transferred to degree programs at George Washington University and many other colleges and universities, providing that they are applicable to the desired curriculum, that the student meets the requirements of the degree program for which application is being made, and that all other requirements of the appropriate school are met. The School of Government and Business Administration limits such credit to a maximum of 15 semester hours. (See page 20 for admission requirements for programs in the School of Engineering and Applied Science.)

ADMISSION AS A DEGREE CANDIDATE

Students wishing to be admitted as candidates for one of the off-campus undergraduate or graduate degree programs of George Washington University may obtain application forms from the College of General Studies, one of the University's off-campus representatives, or the education officer of their agencies or installations. For information on the procedure to be followed when applying for admission to campus degree programs, refer to the appropriate George Washington University bulletin.

An application for admission, required credentials, and a nonrefundable application fee* of $15 (for undergraduate study) or $25 (for graduate study) should be sent to the appropriate office.

Records presented become the property of the University and *cannot* be returned.

---

* The application fee must be by check or postal money order, payable to George Washington University.

The application fee is waived for graduates of this University applying to the Graduate School of Arts and Sciences, and for students applying for readmission who were registered as degree candidates at the time of their last registration at this University and who have not since registered at another institution.

Undergraduate Degree Candidacy—Columbian College of Arts and Sciences

Completed application, required credentials, and the application fee should be sent to the Office of Admissions, George Washington University, Washington, D.C. 20052.

Secondary school graduates applying for Associate's or Bachelor's degree candidacy must present the combined evidence of (1) an acceptable certificate of graduation from an accredited secondary school, showing a minimum of fifteen "units"* in a college preparatory or academic curriculum; (2) College Entrance Examination Board scores for both the Scholastic Aptitude Test and the English Composition Achievement Test. The College Entrance Examination Board tests are preferred; however, the American College Testing battery scores will be accepted. (for students out of high school several years, other appropriate tests may be prescribed). The applicant should request that these scores be sent directly to the Office of Admissions by the Educational Testing Service, Princeton, N.J., or Berkeley, Calif.; or the American College Testing Program, Iowa City, Iowa.

Mature students who do not meet the above requirements may be considered for degree candidacy after the satisfactory completion of at least 15 semester hours of course work with a grade-point average of 2.00 or better. This must include courses in English Composition (Engl 9 or 10 and 11) and 9 semester hours of course work in at least two of the following appropriate areas: Humanities (literature, philosophy, foreign languages), Social Studies (anthropology, economics, geography, history, political science, psychology, sociology), Natural and Mathematical Sciences.

The selection of qualifying courses should be made in conference with the faculty advisor, and a conference concerning plans for study is required of each applicant for admission to candidacy.

Advanced Standing and Advanced Placement

TRANSFER STUDENTS FROM OTHER COLLEGES AND UNIVERSITIES

Properly certified courses taken at accredited institutions of higher learning may be applied toward a degree, subject to the curriculum requirements of the degree program and the rules of the Columbian College of Arts and Sciences. Although a course completed with a grade of *D* is not acceptable for transfer credit, the course may be used to satisfy a curriculum requirement. Credits completed with a *D* grade may not, however, be counted toward the total number of semester hours required for the degree. Any course completed with a grade of *D* or better may not be repeated for the purpose of earning degree credit.

Transfer students whose prior records are not strong enough for admission but who give evidence of potential for successful study, may be given the opportunity to take a trial program. Such students must complete 15 hours of course work in this College with a quality-point index of 2.00 or higher, to be considered for degree candidacy. Courses taken to qualify for candidacy must be distributed over two or more of the following areas: Humanities (literature, philosophy, foreign language), Social Studies (anthropology, economics, geography, history, political science, sociology), and Natural and Mathematical

*A unit represents a year's study in a secondary school subject, including in the aggregate not less than 120 sixty-minute periods, or the equivalent, of prepared classroom work.

Sciences. (Students who have not successfully completed an acceptable college course in English Composition must include Engl 9 or 10 and 11.) An applicant who has been suspended for academic reasons from the University must apply for readmission and may not in the interim take course work at the University. Credit for any work completed during the semester immediately following suspension here may be assigned only by petition if the student should later be readmitted to the University.

The University reserves the right to refuse credit for transfer in whole or in part, or to allow it provisionally. Credit so given may be withdrawn for subsequent poor work.

It is the responsibility of the student to have an official transcript sent directly from each institution formerly attended to the Office of Admissions, George Washington University, Washington, D.C. 20052.

EARNING CREDIT OR WAIVING REQUIREMENTS BY EXAMINATION

In addition to credit allowed in transfer from other accredited colleges or universities, a maximum of 30 semester hours of advanced standing may be obtained by any one or any combination of the following methods.

A student may earn up to a maximum of 30 hours, or waive curricular requirements without limitation (*passing a waiver examination does not entitle the student to any semester hours of credit*), by performing satisfactorily on any or all of the following:

Advanced Placement Tests (APT).—Administered by the College Entrance Examination Board.

Achievement Tests (may be used to waive requirements only).—Administered by the College Entrance Examination Board.

College-Level Examination Program (CLEP).—CLEP offers two types of examinations: General and Subject Examinations. CLEP General Examinations are offered in five areas: mathematics, social sciences, humanities, natural sciences, and English composition. CLEP Subject Examinations measure achievement of specific college-level courses and are offered in more than 20 subjects.

Upon admission to degree candidacy, credit is assigned for the General Examinations, with the exception of the English composition and mathematics examinations. To receive credit, examinations must be passed at the 50th percentile or above (1963/1972 college sophomore norms). Credit is assigned, with a few exceptions, for the Subject Examinations passed at the level recommended in the College Board model policy. A candidate for a degree must seek departmental and dean's approval *prior to* taking the examination to receive credit for a CLEP Subject Examination. Credit may not be earned by passing the examination after having taken the equivalent course. Arrangements for the examinations are the responsibility of the applicant and should be made with the College Entrance Examination Board, College-Level Examination Program, Box 1824, Princeton, N.J. 08540.

Special Departmental Examinations in Columbian College of Arts and Sciences.—A student may request any department of Columbian College to offer a special examination covering the subject matter of any specific course. (If a CLEP Subject Examination is available, the department may choose to

employ it.) Approval is not automatically granted; the student must offer evidence of sufficient background to have a reasonable command of the subject matter. A student who has previously taken examinations to waive course requirements may not subsequently take examinations for credit in the same courses. Assigning credit (or waiving a requirement) by special departmental examinations will depend on the department's evaluation of the examination paper. These examinations will normally be of at least three hours' duration. A $25 fee for each course examination is charged for preparation, administration, and grading of the examination.

Service Schools.—A maximum of 30 (or a maximum of 12 hours if the courses are "professional") semester hours may be obtained on the basis of service schools satisfactorily completed, as evaluated in accordance with the *Guide to the Evaluation of Educational Experience in the Armed Forces.* Ordinarily such subjects are counted as electives. No credit will be allowed for military experience as such.

Correspondence Courses.—A maximum of 15 semester hours may be earned through the successful completion of correspondence courses of college level which are offered by the U.S. Armed Forces Institute or a regionally accredited college or university.

Examination for Waiving Curriculum Requirements.—A student wishing to omit a required course may, with the permission of the faculty advisor, take a waiver examination, the passing of which satisfies the curriculum requirement and qualifies the student for registration in an advanced course. The fee for each 3-hour course examination is $5. *Passing a waiver examination does not entitle a student to any semester hours of credit.*

Credit Earned Through United States Armed Forces Institute (USAFI) or Defense Activity for Non-Traditional Education Support (DANTES).—Credit is assigned for approved USAFI or DANTES college-level examinations passed with satisfactory scores.

Graduate Degree Candidacy

MASTER'S DEGREES

The Degree of Master of Arts in Education (School of Education and Human Development).—Application for Master's degree candidacy should be filed by June 1 for the fall semester, November 1 for the spring semester, or April 1 for the summer session. The completed application, required credentials, and the application fee should be sent to the Office of the Dean of the School of Education and Human Development, George Washington University, Washington, D.C. 20052.

Admission to study toward a Master's degree requires a bachelor's degree from an accredited institution, an undergraduate quality-point index of 2.50 or above (a C+ average), demonstrated interest in education or education-related fields, and appropriate undergraduate course work. Students whose quality-point index is in the range of 2.30 to 2.49 will be considered for provisional admission. The quality-point index is computed on the basis of the last two years of the bachelors' degree program and on all course work completed beyond the baccalaureate. Two years of successful teaching are required before admission to candidacy in the field of school administration. Experience may be required for admission to programs in adult education and human resource development.

The Degree of Master of Business Administration or Master of Public Administration (School of Government and Business Administration).—Forms for application for admission or readmission are available at the Graduate Admissions Office, School of Government and Business Administration, George Washington University, Washington, D.C. 20052. When completed, application forms and all supporting credentials should be submitted to this Office no later than May 1 for the fall semester, November 1 for the spring semester, and April 1 for the summer sessions. Applicants who received their undergraduate degrees from foreign universities must submit applications one month earlier in each case. For further information on these programs, see the ***Undergraduate and Graduate Bulletin.***

The Degrees of Master of Arts in Special Studies or *Master of Science in Special Studies (Graduate School of Arts and Sciences).*—These are interdisciplinary Master's degree programs in specific academic areas offered at off-campus locations by the Graduate School of Arts and Sciences. Application for Master's degree candidacy must be made by members of the group before registration. Completed application, required credentials, and the application fee should be sent to the Office of the Dean of the Graduate School of Arts and Sciences, George Washington University, Washington, D.C. 20052.

Admission to graduate study toward a Master's degree in this School requires a bachelor's degree, from an accredited college or university, with an over-all quality-point index of 3.00 (a *B* average) or an equivalent grade.

A maximum of one-quarter of the semester hours of graduate course work required for a degree may be approved for transfer to the Graduate School from the Division of University Students, another degree-granting division of this University, or another accredited college or university. See page 95 of the *Undergraduate and Graduate Bulletin* for further restrictions on transfer of credit.

The Degrees of Master of Science or *Master of Engineering Administration (School of Engineering and Applied Science).*—Application for Master's degree candidacy *must* be made before registration. Completed application, required credentials, and the application fee should be sent to the Manager of Engineering Admissions, Room 103, Tompkins Hall of Engineering, George Washington University, Washington, D.C. 20052.

Admission to graduate study toward a Master's degree requires an appropriate Bachelor's degree from a recognized institution and evidence of capacity for productive work in the field selected, as indicated by undergraduate grades, Graduate Record Examination scores, and similar data.

An applicant who has significant deficiencies in preparation may be required to take prescribed undergraduate courses as an unclassified student before being admitted to graduate student status. In some cases, if such deficiencies are minimal, he may be admitted to graduate student status and allowed to take a limited number of graduate courses while completing the undergraduate courses in which he is deficient. In no case may the undergraduate courses thus taken fulfill any part of the requirements for the Master's degree.

Students wishing to apply for admission to the program of study leading to the degree of Master of Engineering Administration must meet the following additional admission requirements: (1) the applicant must have an adequate knowledge of the principles of human relations, the fundamentals of engineering economic analysis, and the fundamentals of quantitative methods

This requirement can be met by satisfactory completion of the following undergraduate courses or approved equivalents: EAd 150, *Introduction to Engineering Administration;* EAd 160, *Introduction to Engineering Economic Analysis;* and EAd 170, *Basic Quantitative Methods for Engineering Administration.* (2) The applicant may be required to complete other undergraduate prerequisite courses prescribed as a condition of admission. (3) A student is required to earn the grade of *C* or better (unless the requirement is stipulated to be a grade of *B* or better upon admission) in each undergraduate prerequisite course. If this scholarship requirement is not met, the student is barred from further enrollment. A student is not permitted to repeat any of the undergraduate prerequisite courses. Credit for prerequisite courses is not applicable toward the degree of Master of Engineering Administration, and, unless approved by the department chairman, all prerequisite courses must be completed prior to taking graduate courses in this degree program.

Up to six semester hours of satisfactory credit (with grades of *A* or *B*), which normally must have been earned in a graduate program at another recognized institution, *may* be accepted in transfer, when applicable, to satisfy Master's degree requirements in the School of Engineering and Applied Science. However, the student must, with the approval of the advisor, petition to the appropriate department chairman for such a transfer.

EDUCATION SPECIALIST DEGREE

The Degree of Education Specialist (School of Education and Human Development).—Each applicant must be interviewed and recommended by a staff member of the School of Education and Human Development or by a representative in the candidate's locality appointed by the Dean. Admission requires a Master of Arts in Education degree from this University, a satisfactory score on the Miller Analogies Test or the Graduate Record Examination, or grades in graduate course work which meet standards set by the Advanced Graduate Faculty, and two years of successful pertinent experience. Completed application, required credentials, and the application fee should be sent to the Office of the Dean of the School of Education and Human Development, George Washington University, Washington, D.C. 20052.

PROFESSIONAL DEGREE

Professional Degree Program (School of Engineering and Applied Science).—Application for Professional degree candidacy, together with nonrefundable application fee, should be sent to the Manager of Engineering Admissions, Room 103, Tompkins Hall of Engineering, George Washington University, Washington, D.C. 20052.

Admission to graduate study toward the Professional degree requires an appropriate Master's degree from a recognized institution and evidence of capacity for productive work in the field selected as indicated by prior scholarship and, where appropriate, professional experience.

Normally, a *B* average in graduate work is required. However, the minimum does not assure automatic acceptance; the departments may, and often do, set higher admission standards.

Up to six semester hours of satisfactory credit (with grades of *A* or *B*) beyond a Master's program, which must have been earned in the five years

preceding the start of study toward the Professional degree, may be accepted in transfer when applicable to satisfy Professional degree requirements in this School. However, the student must, with the approval of the advisor, petition to the appropriate department chairman for such a transfer.

DOCTOR OF SCIENCE DEGREE

The Degree of Doctor of Science (School of Engineering and Applied Science).—The prospective doctoral student seeking admission should apply before June 1 for the fall semester and before December 1 for the spring semester. Personal interviews may then be arranged to discuss the applicant's qualifications and the possibilities for an effective doctoral program. The applicant must arrange for complete documentary records (transcripts) to be forwarded to the Manager of Engineering Admissions, Room 103, Tompkins Hall of Engineering, George Washington University, Washington, D.C. 20052, in sufficient time to permit assembly of complete records for evaluation as soon after the above application deadlines as possible.

To be admitted to the doctoral program, a satisfactory master's degree from an accredited institution is required, together with acceptable personal qualities and a capacity for creative scholarship. Normally, a *B* average in graduate work is required. However, the minimum does not assure automatic acceptance; the departments may, and often do, set higher admission standards. The applicant must arrange for letters of recommendation to be submitted from two faculty members of the institution from which the Master's degree was received; one of these, if possible, should be from the Master's advisor. The letters should be addressed to the appropriate department chairman.

Up to six semester hours of credit earned in courses completed with the grade of *A* or *B* while enrolled in a doctoral program at another accredited institution may be accepted in transfer to satisfy doctoral requirements of this School, subject to the approval of the student's advisor and his department chairman. Credit earned in courses completed more than five years prior to admission to the doctoral program will not be accepted in transfer, and some departments may require that transfer credit must have been earned within a shorter period of time before admission.

READMISSION

A student who withdraws, is suspended, or is otherwise absent from the University for one or more spring or fall semester, must make formal application for readmission. If readmitted, the student is subject to the rules and regulations in force at the time of return. Complete and official transcripts from each institution the student has attended since making the previous application must be sent to the appropriate office at this University before the application for readmission can be evaluated.

The application fee is waived for students applying for readmission who were registered as degree candidates at the time last registered at this University and who have not since registered at another institution.

Registration

Off-campus registration is conducted before or at the first class meeting of each course, at times and places stated in the *Off-campus Schedule of Classes*, available well in advance of each semester.

Registration in an off-campus course *constitutes admission to that course only*. It does not admit the student to campus courses or to degree candidacy. Only students admitted to degree candidacy may enroll as full-time students (for 9 semester hours or more). Students taking course work to qualify for degree candidacy who are registered in this College may not take more than 10 hours in a semester. Those who have graduated from high school recently and wish to be *full-time freshmen* at this University should apply for admission to the appropriate college or school on campus.

Off-campus degree candidates in an area of concentration with a small enrollment which would not justify offering certain required courses off campus may have to register for campus courses in order to meet the requirements for the degree. See page 29, "Campus Study," for details concerning permission to register for campus courses.

Auditing.—With the permission of the instructor, students may register as auditors. An auditor is not required to take active part or to take examinations; the auditor receives neither grades nor credit. Tuition is the same for the auditor as for the student registered for credit. With the approval of the dean, a student may change from credit to audit status during the first third of the semester. A student who takes a course as an auditor may not repeat it later for credit.

Concurrent Registration.—A student registered as a degree candidate in any other college or school of the University may take degree credit courses in the College of General Studies *only by permission (granted prior to registration) of the dean* of the college or school concerned. A College of General Studies Off-campus Concurrent Registration Permit form must be obtained from the appropriate college or school, signed by the dean of that college or school, and presented at the time of registration in the College of General Studies.

Any degree candidate taking course work in another college or school of the University or at another institution through the Consortium of Universities of the Washington Metropolitan Area, Inc., must have the dean's permission.

Fees and Financial Regulations

All fees should be paid by check or money order, made payable to George Washington University. The student identification number should appear in the upper left-hand corner.

The following fees and financial regulations were adopted for the 1979 summer sessions and academic year 1979–80. (See page 25–26 for projected tuition and fee increases for 1980–83.)

Tuition*

On campus:

Part-time undergraduate program, other than in the School of Engineering and Applied Science, for each semester hour	$117.00
Part-time undergraduate program in the School of Engineering and Applied Science, for each semester hour	119.00
Graduate study, other than in the School of Engineering and Applied Science, for each semester hour	117.00
Graduate study in the School of Engineering and Applied Science, for each semester hour	119.00
Summer Sessions, for each semester hour:	
Other than the School of Engineering and Applied Science	110.00
School of Engineering and Applied Science	112.00

Off campus:

For each semester hour†	88.00
School of Engineering and Applied Science off-campus programs, for each semester hour‡	119.00

§Thesis:

Master of Arts in Education and Master of Science in Administration degree programs for each semester hour	117.00
School of Engineering and Applied Science programs, for each semester hour‡	119.00

University Center Fee (charged only to students registered on campus)

For students registered for 11 or more semester hours on campus:	
For each semester	50.50
For students registered for less than 11 semester hours in a semester on campus:	
For each semester hour for which the student registers	4.75

Charles E. Smith Center Fee (for off-campus degree candidates only) Students registered as degree candidates in a program offered through the College of General Studies may purchase, on a semester-by-semester basis, a special card entitling them to use the Smith Center facilities for that semester or session. Students must first obtain from CGS a signed certificate attesting to degree candidacy 25.00

Special Fees

Application fee (undergraduate degree candidate), nonrefundable	15.00
Application fee (graduate degree candidate), nonrefundable	25.00

---

* Students interested in full-time undergraduate study on campus should consult the appropriate bulletin (*Undergraduate and Graduate, School of Engineering and Applied Science*, or *Section on Medicine and Health Sciences Programs*).

† Except School of Engineering and Applied Science programs.

‡ This fee does not apply to special off-campus programs arranged with the School of Engineering and Applied Science.

§ Payment of tuition for a master's thesis entitles the candidate, during the period of registration, to the advice and direction of the member of the faculty under whom the thesis is to be written. In case a thesis is unfinished, additional semester hours may be required in accordance with the regulations of the school in which the student is registered.

Graduation fee, due and payable at the time of registration for the last semester or summer session:	
Associate's degree	$ 10.00
Bachelor's, Master's, Education Specialist, and Doctor of Science degrees	25.00
Special Columbian College of Arts and Sciences departmental examination fee, for each course to qualify for receiving credit (advanced standing), waiver of requirement, or both	25.00
Late-registration fee, for failure to register for campus courses within the designated period	15.00
Fee for binding two copies of the master's thesis	15.00
Fee for microfilm service and printing announcement of final examination (Doctor of Science candidates)	65.00
Late-payment fee, for failure to make payments when due (see "Payment of Fees," pages 26–27)	15.00
On-campus financial reinstatement fee, for reinstatement after financial encumbrance for nonpayment of fees (see "Payment of Fees," pages 26–27)	35.00
Off-campus financial reinstatement fee, for reinstatement after financial encumbrance for nonpayment of fees (see "Payment of Fees," pages 26–27)	15.00
Returned check fee, charged a student whose check is improperly drafted, incomplete, returned by the bank for insufficient funds, or returned for any other reason	15.00
For each waiver examination to qualify for advanced placement	5.00
Transcript fee, for each transcript of record	2.00
If two or more transcripts are requested at the same time, fee for each of the first two copies is $2; fee for each additional copy	.50
Replacement of lost or stolen picture identification card	2.00

PROJECTED TUITION AND FEE INCREASES 1980–83

Projected increases for the academic years 1980–81, 1981–82, and 1982–83 have been estimated as follows:

On Campus*

Increase by semester hour (graduate and part-time undergraduate students):

1980–81	$8.00
1981–82	8.00
1982–83	9.00

Off Campus

Increase by semester hour (except School of Engineering and Applied Science programs):

Course Work Other Than Thesis:

1980–81	6.00
1981–82	6.00
1982–83	6.00

* Students interested in full-time undergraduate study on campus should consult the appropriate section (*Undergraduate and Graduate, School of Engineering and Applied Science,* or *School of Medicine and Health Sciences Programs*).

Thesis for Master of Arts in Education program:

1980–81	$8.0
1981–82	8.0
1982–83	9.0

*Increase by semester hour (School of Engineering and Applied Science programs, including thesis):

1980–81	18.0
1981–82	8.0
1982–83	9.0

It is not possible to project future economic data with certainty. The in creases outlined above are merely estimates based on present circumstances and should in no way be interpreted as fixed limits on tuition increases. The Uni versity hopes to keep tuition increases as low as possible, but it is obligated to maintain a sound financial basis. Economic conditions in the recent past, par ticularly as they affect private educational institutions, have been extremely variable, and significant increases in tuition in excess of the above limits may be required.

PAYMENT OF FEES

OFF-CAMPUS COURSES

Fees for each semester are due and payable in full at the time of each regis tration; however, a student registering for a *13-week or longer credit course* may sign a deferred payment contract at each registration to make payment in three equal installments—one-third at the time of registration, one-third by October 5, 1979, and one-third by November 5, 1979 (for the fall semester), one-third by February 8, 1980, and one-third by March 7, 1980 (for the spring semester). Payments are due at the stipulated times. Interest at the rate of 8 per cent per annum on the unpaid balance will be charged from the beginning of each semester to the date payment is made.

Students receiving partial government tuition assistance must pay their por tion of the tuition in full at the time of registration.

Except for specified special sessions, tuition and fees for credit courses last ing less than 13 weeks, and for all noncredit courses, are payable in full at registration.

Students who fail to make any payment when due will be automatically charged a $15 late-payment fee and will be subject to an interest charge of 8 per cent per annum. Accounts which become 30 days past due will be finan cially encumbered. In the event a student's account is financially encumbered, the student forfeits his rights to the use of deferred payment contracts in fu ture semesters, and the Student Accounts Office will notify the Registrar to withhold grades, future registration privileges, transcripts, diplomas, and other academic information until the account is settled financially. Financial settle ment will require payment in full of all amounts due the University in addi tion to a financial reinstatement fee of $15.

Students auditing courses are subject to all fees charged to students regis tered for credit.

*This increase by semester hour does not include the projected increases for special off-campus programs arranged with the School of Engineering and Applied Science.

CAMPUS COURSES

No student is permitted to complete registration or attend classes until all charges are paid. Tuition and fees for each semester are due and payable in full at the Office of the Cashier at the time of each registration. Checks and postal money orders should be made payable to George Washington University. All financial credit is made by student number. It is therefore essential that the student identification number appear in the upper left-hand corner of the check.

The Student Accounts Office has responsibility for billing and maintaining student accounts for tuition, various fees, and room and board charges. A student registered for six semester hours or more may sign a deferred payment contract with the Student Accounts Office at the time of each registration permitting payment of one-half of the total tuition and fees (except for fees payable in advance) at the time of registration and the remaining half on or before October 24, 1979 (for the fall semester) and March 5, 1980 (for the spring semester). Interest at the rate of 8 per cent per annum on the unpaid balance will be charged from the date of registration to the date payment is made.

Students receiving tuition assistance in the form of scholarships, government tuition contracts, or other forms of tuition awards are not permitted to sign deferred payment contracts unless the total tuition and fee charges exceed the value of the tuition awards by $800 or more. Under such circumstances the student may be permitted to pay one-half of the amount due at the time of registration and to defer the balance by signing a deferred payment contract.

Students who fail to make any payment when due will be automatically charged a $15 late-payment fee and will be subject to the interest charge of 8 per cent per annum. Accounts which become 30 days past due will be financially encumbered. In the event a student's account is financially encumbered, the student forfeits rights to the use of deferred payment contracts in future semesters, and the Student Accounts Office will notify the Registrar to withhold grades, future registration privileges, transcripts, diplomas, and other academic information until the account is settled financially. Financial settlement will require payment in full of all amounts due to the University in addition to a financial reinstatement fee of $35.

Students auditing courses are subject to all fees charged to students registered for credit.

REFUND OF FEES FOR OFF-CAMPUS REGISTRATION*

Applications for withdrawal from the University or for change in class schedule must be made in person or in writing to the dean of the college, school, or division in which the student is registered. Notification to an instructor is not an acceptable notice (see "Changes in Program of Studies," page 31).

In authorized withdrawals and changes in schedule, cancellations of semester tuition charges will be made in accordance with the following schedule for the academic year:

---

* For regulations concerning refunds of fees for students who register for courses on campus, see the appropriate bulletin (*Undergraduate and Graduate, the School of Engineering and Applied Science* or *Summer Sessions Programs*).

REFUND SCHEDULE 1979–1980

Long Session (or any session longer than 13 weeks)

90% Starting date of class plus 6 calendar days
75% Starting date of class plus 20 calendar days
50% Starting date of class plus 34 calendar days
0% Starting date of class plus 35 calendar days to end

Intermediate Session (9 weeks, 1 day per week)

90% Starting date of class plus 6 calendar days
75% Starting date of class plus 13 calendar days
50% Starting date of class plus 20 calendar days
0% Starting date of class plus 21 calendar days to end

Short Session (7 weeks, 2 days per week)

90% Starting date of class plus 2 calendar days
75% Starting date of class plus 8 calendar days
50% Starting date of class plus 15 calendar days
0% Starting date of class plus 16 calendar days to end

Mini Session (3 weeks)

90% Starting date of class plus 1 calendar day
75% Starting date of class plus 5 calendar days
50% Starting date of class plus 9 calendar days
0% Starting date of class plus 10 calendar days to end

No refund will be awarded for sessions of less than 21 days.

No exceptions will be made for holidays, late registration, absences, or class rescheduling for any reason whatsoever.

In no case will tuition be reduced or refunded because of absence from classes.

Payment applies only to the semester for which a registration charge is incurred and will not be credited to another semester.

Authorization to withdraw and certification for work done will not be given a student who does not have a clear financial record.

LAW ENFORCEMENT EDUCATION PROGRAM

This program of grants and loans, authorized under the provisions of the Omnibus Crime Control and Safe Streets Act of 1968, is intended to help pay the cost of educational expenses for employees of state and local criminal justice agencies. Studies may be full- or part-time in a wide range of subject areas and degree goals. Applications and further information are available from the LEEP Coordinator, Graduate School of Arts and Sciences, telephone 676-6210.

Regulations

CAMPUS STUDY

OFF-CAMPUS DEGREE CANDIDATES may register for campus courses approved for their programs if these courses are not available at off-campus centers. Columbian College degree candidates must notify the Office of Student Records, College of General Studies, telephone 676-7017, at least two weeks prior to the date of campus registration. School of Education and Human Development degree candidates call 676-6160 four weeks in advance of campus registration. Other off-campus degree candidates should call the appropriate school two weeks in advance as follows: Graduate School of Arts and Sciences students call 676-6210; School of Government and Business Administration graduate students call 676-6584; and School of Engineering and Applied Science students call 676-6158. Registration materials may be picked up by the students at building K, 817 23rd St., N.W., during registration.

A student may register for on-campus courses as a nondegree student in the Division of University Students, telephone 676-6370.

ATTENDANCE

Students may not attend classes until registration is completed and fees due are paid. They may attend only those classes for which they are registered. Regular attendance is expected. Students may be dropped from any course for undue absence.

SCHOLARSHIP

Grades

Grades are mailed to students through the Office of the Registrar at the close of each semester. They are not given out by instructors.

UNDERGRADUATE

The following grading system is used: *A*, Excellent; *B*, Good; *C*, Satisfactory; *D*, Low Pass; *F*, Fail; *I*, Incomplete; *IP*, Progress; *W*, Authorized Withdrawal; *Z*, Failure, Unauthorized Withdrawal; *CR*, Credit; *NC*, No Credit. Except for courses which specifically state that repetition for credit is permitted, a candidate for a degree at this University may not repeat for credit a course in which a grade of *D* or better was received, unless required to do so by the department concerned. A written statement to this effect must be submitted to the Registrar by the appropriate departmental chairman.

GRADUATE

The following grading system is used: *A*, Excellent; *B*, Good; *C*, Minimum Pass; *F*, Fail; *I*, Incomplete; *IP*, Progress; *CR*, Credit; *W*, Authorized Withdrawal; *Z*, Failure, Unauthorized Withdrawal. Except for courses which specifically state that repetition for credit is permitted, a student taking School of

Education and Human Development and School of Government and Busines Administration courses may not repeat for credit a course in which a grad of *C* or above was received. A student taking a Graduate School of Arts an Sciences course may repeat for credit a course in which a grade of *C* or abov was received only when permitted to do so by the department concerned, un less the course description states that the course may be repeated for credi A written statement to this effect must be submitted for approval to the dean' office. It is then filed with the Registrar. A student taking School of Enginee ing and Applied Science courses may not repeat for credit a course in whic a grade of *C* or above has been received, unless required to do so by the de partment concerned; a written statement requiring the student to repeat such course for credit must be submitted to the Registrar by the appropriate de partment chairman.

INCOMPLETE/AUTHORIZED WITHDRAWAL

When another grade has not been assigned, the symbol *I* (Incomplete), the symbol *W* (Authorized Withdrawal), or the symbol *Z* (Failure, because o unauthorized withdrawal) will be recorded. The symbol *I* indicates that a satisfactory explanation has been given the instructor for the student's inabilit to complete the required work of the course. At the option of the instructor the grade of *I* may be recorded if a student, for reasons beyond the student' control, is unable to complete the work of the course and if the instructor is informed of, and approves, such reasons before the date when grades must be reported. The grade may be used only if the student's performance and class attendance in the course have been satisfactory. Any failure to complete the work of a course which is not satisfactorily explained to the instructor before the date when grades must be turned in will be graded *F*. If acceptable reasons are later presented to the instructor, the instructor may initiate an ap propriate grade change.

REMOVING AN INCOMPLETE

For information concerning the removal of a grade of Incomplete from a stu dent's record, consult the regulations of the college, school, or division con cerned (see pages 45, 57, 61–62, 67).

THE QUALITY-POINT INDEX*

Scholarship is computed in terms of the quality-point index. This is done by dividing the total number of quality points by the total number of semester hours in which the student has received grades of *A* to *F*. Quality points are computed from a numerical equivalent assigned each grade: *A*, 4 points; *B*, 3 points; *C*, 2 points; *D*, 1 point; *F*, no points. Example: if a student received an *A* in one three-credit course, and a *B* in another three-credit course, he would compute his quality-point index this way:

A = 4 x 3 (semester hours) = 12
B = 3 x 3 (semester hours) = 9

6 — 21 ÷ 6 = 3.5 quality-point index

* Not applicable to Columbian College or to graduate study in the School of Engineering and Ap plied Science.

Courses marked *W*, *I*, *IP*, *CR*, or *NC* are not considered in determining the index, except that courses marked *I* will be considered after a formal grade is recorded. With the exception of Consortium courses, grades in courses taken at other institutions are not considered in computing the quality-point index.

WARNINGS*

At stated intervals during the academic year, students who are doing work of *D* grade or lower in courses with departmental numbers below 100 receive "warnings." A "warning" constitutes notice to the student that he or she must consult the instructor and the advisor at the earliest opportunity. "Warning periods" are established during the seventh and eighth weeks of 13-week courses, and during the third and fourth weeks of six and a half week courses.

CHANGES IN PROGRAM OF STUDIES

DROPPING A COURSE OFF CAMPUS

A course may be dropped without academic penalty during the first third of the semester (first through third class meeting in the School of Government and Business Administration; first through fourth class meeting in all other schools). Withdrawing from a course without academic penalty after this period requires approval of a written request, *accompanied by a completed change slip*, addressed to the Dean of the College of General Studies.

Procedure for Dropping Courses.—An off-campus Change Slip (obtainable from the instructor or from the College of General Studies) must be completed, and signed by the student and the instructor, and submitted to the College of General Studies. The instructor will indicate on the Change Slip whether or not the student is passing. Merely reporting a withdrawal to an instructor does not effect official withdrawal from a course. The effective date of withdrawal will be determined by the appropriate dean. Full refund, if appropriate, will also be indicated by the dean.

Failure to follow the proper procedure will result in the Office of the Registrar recording the grade of *Z* and, regardless of the time of discontinuance, will not relieve the student of financial responsibility for the entire course.

DROPPING A COURSE ON CAMPUS

A campus Change Slip (available at the Office of the Registrar) must be completed and signed, and dated by the instructor and submitted as follows: Columbian College degree candidates submit theirs to the Office of Counseling and Student Services, College of General Studies. All other degree candidates submit their campus Change Slips to the appropriate dean.

Each college, school, and division of the University sets deadline dates for each semester concerning withdrawal. Withdrawal between these dates and the end of the semester is permitted only in exceptional circumstances.

All charges for courses dropped without the approval of the dean must be met by the student. Reporting the dropping of a course to an instructor does not constitute an official withdrawal.

* Not applicable to the School of Government and Business Administration

TRANSFER WITHIN THE UNIVERSITY

Transfer from a degree program in one college, school, or division of the University to another may be made only with the approval of the deans concerned. Applications for transfer are available at the University's Office of Admissions or at the office of the appropriate dean. Upon transfer the student should consult his or her faculty advisor as to the requirements that must be fulfilled.

A maximum of 42 semester hours is transferable toward the Associate in Arts in General Studies degree; a maximum of 90 semester hours is transferable toward a Bachelor's degree; and a maximum of nine semester hours is transferable toward the degree of Master of Arts in Special Studies, Master of Science in Forensic Science, or Master of Science in Special Studies. Students transferring within the University are advised to note the residence requirements of the degree sought.

CREDIT

Credit toward a degree is given only after registration for and satisfactory completion of the required course work, or upon the granting of advanced standing in accordance with the regulations of the several colleges, schools, and divisions.

For transfer from credit to audit status, see page 23.

BALANCE SHEET

On request, the Office of the Registrar will issue to undergraduate degree candidates a balance sheet showing the amount of work completed and the requirements remaining to be met for the degree. A second balance sheet is issued only if the student changes major or degree objectives.

TRANSCRIPTS OF RECORD

Official transcripts of student records are issued on written request of the student or former student who has a clear financial record. A fee of $2 is charged for each transcript. When more than two transcripts are ordered at the same time, a $2 fee is charged for each of the first two transcripts and a $.50 fee is charged for each additional transcript. Partial transcripts are not issued.

CONTINUOUS ENROLLMENT

Once entered in a degree program, a student is expected to be continuously enrolled and actively engaged in fulfilling the requirements for the degree each semester of the academic year until such time as the degree is conferred. Should the student break continuous enrollment at the University and not request or be granted a leave of absence (see below) or be assigned by the dean to inactive status (see below) the student must apply for readmission and if granted, be subject to the requirements and regulations then in force.

LEAVE OF ABSENCE

Should a degree student find it necessary to interrupt active pursuit of the degree, the student may petition the dean for a leave of absence for a specific period of time, generally limited to one calendar year. A degree student who

discontinues active enrollment in degree studies without being granted a leave of absence, or a student granted a leave who does not return to active study at the close of the period of approved absence, must apply for readmission and be subject to the regulations and requirements then in force. No fees are assessed students while on leave of absence.

INACTIVE STATUS

Under the regulations established by each school and college a student may be considered in continuous pursuit of the degree while not enrolled in courses at the University when engaged in the following: cooperative engineering-work semester; "year abroad program;" attendance at another institution with prior approval to have work transferred back to the GW program; completion of outstanding work in courses in which a grade of "Incomplete" was received, and non-course instructional activities unique to the particular school or college. To be enrolled in inactive status a student must request, in advance of the year or semester concerned, and be granted approval for the specific activity desired. This status is generally limited to one year and no fees are assessed students while in this status.

GRADUATION REQUIREMENTS

Degrees are conferred in February, May, and September.

To be recommended for graduation a student must have met the admission requirements of the college or school in which registered; completed satisfactorily the scholarship, curriculum, residence, and other requirements for the degree for which registered; and be free from all indebtedness to the University. Enrollment is required for the semester or summer session at the close of which the degree is to be conferred. A letter concerning degree completion is sent to military files upon request.

Application for Graduation.—An "Application for Graduation" form *must* be filed and the appropriate fee paid at the time of registration for the last semester or summer session of the senior or final year. Students completing degree requirements during the Summer Sessions will be awarded diplomas (no formal graduation) September 30, *provided* they have completed all degree requirements and have applied for graduation as a part of registration for the Summer Sessions.

Scholarship.—The student must meet the scholarship requirements for the particular degree for which he is registered.

Curriculum.—Minimum curriculum requirements for each degree are stated under the college or school offering work in preparation for the degree.

Residence.—A student is "in residence" only when registered for course work after filing formal application for degree candidacy or for the 15 semester hours undertaken to qualify for degree candidacy (see the specific residence requirements for the degree concerned).

Leave of absence.—With the permission of the appropriate dean, a student may be granted leave of absence.

Transfer credit.—Except for Master's degree candidates in the Graduate School of Arts and Sciences, the School of Education and Human Development, and the School of Engineering and Applied Science, service personnel who receive military transfer credits when they are within six hours of a degree may, by special arrangements, be permitted to complete their work elsewhere, transfer these credits to the ap-

propriate school or college, and receive a degree from the University. This p
cedure does not apply to Master's candidates who have been granted six ho
of transferred credit or have not completed the required courses.

Attendance and Conduct.—The University reserves the right to refuse
confer a degree upon a candidate whose attendance or conduct has been un
isfactory.

Thesis or Dissertation.—A thesis or dissertation submitted in partial ful
ment of requirements for a degree must be presented in its final form to
dean of the college or school concerned no later than the date specified in
University Calendar.

Accepted theses and dissertations, with accompanying drawings, become
property of the University and are deposited in the University Library, wh
the duplicate copies are bound and made available for circulation. See the
propriate college or school in this bulletin for regulations governing theses
dissertations.

HONORS

Dean's List.—To be eligible for inclusion on the Dean's List, a student m
be a candidate for an undergraduate degree. Course work taken while the
plication for admission is being processed will be computed in determining
gibility for the Dean's List. In Columbian College of Arts and Sciences deg
programs, a student must have received grades of *A* in at least 60 per cent of
last 15 semester hours of work and no grades below *B* for that semester.

With Distinction.— The undergraduate degrees may be conferred "With D
tinction," at the discretion of the Dean's Council of the College and the Co
mittee on Scholarship. In Columbian College of Arts and Sciences programs
student must have received grades of *A* in at least 60 per cent of the cour
taken at this University.

To be eligible a student must have completed at this institution at le
one-half of the course work required for the degree.

Special Honors. Special Honors may be awarded to any member of
graduating class for outstanding achievement in the student's major field ap
recommendation of the major department. The student must fulfill all the
lowing requirements:

1. Candidacy for Special Honors must be approved by the faculty mem
representing the major department or field not later than the beginning of
senior year.

2. Such other conditions as may be set at the time candidacy is approv
must be met.

3. At least one-half of the courses required for the degree must have be
completed at GW.

4. The specific requirement of the college or school in which register
must be fulfilled. In Columbian College of Arts and Sciences the student m
have received grades of *A* or *B* in 50 per cent of the courses taken at this
stitution.

Note: A student may receive the Associate in Arts degree "With Distinctio
if the student has taken at this institution at least one-half of the courses
quired for the degree and has received the grade of *A* in at least 60 per ce
of these courses.

ACADEMIC DISHONESTY

The University community, in order to fulfill its purposes, must establish and maintain guidelines for academic behavior. Members of the community are expected to exhibit honesty and competence in their academic work.

Incoming students have a special responsibility to acquaint themselves with, and make use of, all proper procedures for doing research, writing papers, and taking examinations.

Members of the community will be presumed to be familiar with the proper academic procedures and held responsible for applying them. Deliberate failure to act in accordance with such procedures will be considered academic dishonesty. Acts of academic dishonesty are a legal, moral, and intellectual offense against the community and will be prosecuted through the proper University channels.

Copies of the University policy on academic dishonesty can be obtained from the following officers: all department chairmen, all academic deans, and the Vice President for Academic Affairs.

STUDENT CONDUCT

All students upon enrolling and while attending The George Washington University are subject to the provisions of the *Statement of Student Rights and Responsibilities* which outlines student freedoms and responsibilities of conduct, the Judicial System for Non-Academic Student Discipline, and other policies and regulations as adopted and promulgated by appropriate University authorities. Copies of these documents may be obtained at the Office of the Vice President for Student Affairs. Sanctions for violation of these regulations may include permanent expulsion from the University which may make enrollment in another college or university difficult. Regulations or requirements applicable only to a particular program, facility, or class of students may not be published generally, but such regulations or requirements shall be published in a manner reasonably calculated to inform affected students. With respect to off-campus students registered in the College of General Studies, all matters pertaining to grievances, petitions, personal conduct, discipline, and academic dishonesty will be referred to the appropriate dean or department chairman for adjudication or resolution in accordance with established University procedures.

THE LIBRARY

A student registered in the College of General Studies is entitled to the use of the University Library. Its stacks are open, and all students are welcome to browse at their leisure. A permit form for library privileges is issued to each student. A borrower's card may be obtained by presenting the permit form at the circulation desk of the Library.

The loan period for stack books is 14 days. Any book which circulates is subject to recall by the Library if needed for reserve or other use. Reserve books must be used in the reserve reading room when the library is open, except that they may be withdrawn for overnight use beginning at 8:30 p.m. Transcripts of grades are withheld until a student's library record is clear, with all borrowed books returned and any fines paid.

All students using the University Library are expected to be familiar with its detailed regulations, available at any of the library's service desks.

RIGHT TO DISMISS STUDENTS

The right is reserved by the University to dismiss or exclude any student fro the University, or from any class or classes, whenever, in the interest of th student or the University, the University Administration deems it advisable.

RIGHT TO CHANGE RULES

The University and its various colleges, schools, and divisions reserve the rig to modify or change requirements, rules, and fees. Such regulations shall g into force whenever the proper authorities may determine.

RIGHT TO MAKE CHANGES IN PROGRAMS

The right is reserved by the University to make changes in programs witho notice whenever circumstances warrant such changes.

UNIVERSITY POLICY ON RELEASE OF STUDENT INFORMATION

The Family Educational Rights and Privacy Act of 1974 applies to insti tional policies governing access to and release of student education record maintained by educational institutions which are recipients of federal funds The University complies with this statute, which states, in part, that such ins tutions must:

1. afford students access to education records directly related to them;
2. offer students an opportunity for a hearing to challenge such records a inaccurate, misleading, or otherwise inappropriate;
3. receive students' written consent before releasing information from the education records to persons outside the University, except as provide by the Act and except for directory information as indicated below. formation may be furnished to a student's parents without such writt consent only upon certification of the student's financial dependency. an
4. comply with a judicial order or lawfully issued subpoena to release student's record, notifying the student of this action.

The University will release the following directory information upon reque name, local address, and telephone number; name and address of next of kin dates of attendance; school, college, or division of enrollment; field of stud credit hours earned; degrees earned; honors received; participation in organiz tions and activities chartered or otherwise established by the University (in cluding intercollegiate athletics), and height and weight of members of athle teams. A student who does not wish such directory information released must file written notice to this effect in the Office of the Registrar.

University guidelines on the release of student information may be obtained from the Office of the Registrar.

Student Services

HONOR SOCIETIES

Alpha Sigma Lambda.—A national honor society for part-time evening col lege and off-campus undergraduate degree students, the purpose of which is

to recognize and encourage scholarship and leadership among undergraduate degree candidates. Membership is limited to students who have been enrolled for four semesters or terms in the College of General Studies and have completed 30 semester hours of work toward a degree with a 3.50 average, or equivalent. The Alpha Alpha Chapter was established at George Washington University in 1965.

Phi Beta Kappa.—Undergraduate degree candidates in the College of General Studies programs are eligible for membership in Phi Beta Kappa, a national scholarship honorary society. The society recognizes "outstanding intellectual capacity well employed" in the field of liberal arts and sciences. Senior and junior students who are candidates for the degree of Bachelor of Arts, Bachelor of Science, or Bachelor of General Studies in Columbian College, and who have shown broad cultural interests, distinguished scholarly achievement, high character, general promise, and scholarly ideals may, to a number not exceeding 15 per cent of a class, be elected to membership by the faculty members of the Alpha Chapter of the District of Columbia. Seniors and juniors in other schools of the University who meet the above requirements are also eligible for consideration for membership, provided that their program of studies includes appreciable work in the liberal arts.

COUNSELING

Students in the off-campus programs may obtain educational counseling and assistance in program planning through the Office of Counseling and Student Services or from University representatives at the various off-campus centers. The Office of Counseling and Student Services coordinates student personnel services, including adult academic counseling, vocational guidance as related to educational programs, and liaison with other University departments and services, as well as serving as a resource center for information on tuition assistance available to students in the College of General Studies programs. Appointments may be made by calling the College of General Studies, telephone 676-7000, or through the Education Director at locations where courses are scheduled. University counselors are also available at all locations during announced registration periods and at scheduled times each month.

UNIVERSITY BOOKSTORE

Textbooks may be ordered by mail from the University Bookstore. Forms for this purpose are available at registration. The hours of the Bookstore will be announced in the *Schedule of Classes.*

The Bookstore is located in the Cloyd Heck Marvin Center, 800 21st Street, N.W.; telephone 676-6870.

VETERANS BENEFITS

The veterans counselor, 5th floor Luther Rice Hall, 2121 Eye Street, N.W., assists students entitled to educational benefits as veterans or as widows or children of deceased or totally disabled veterans with any problems which may arise concerning their benefits. The Office also processes certification of enrollment and attendance to the Veterans Administration so that educational allowances will be paid.

When feasible, students entitled to benefits as veterans or dependents of veterans should consult with the veterans counselor prior to submitting ap-

plication to the Veterans Administration. All such students should obtain the instruction sheet issued by the veterans counselor which sets forth requirements to be fulfilled before certification of enrollment can be made to the Veterans Administration and which includes other information of general interest.

The Veterans Administration is at 941 N. Capitol St., N.E., Washington, D.C. 20421.

STUDENT AND ALUMNI CAREER SERVICES OFFICE

The Career Services Office provides career guidance and placement to GW students and alumni. Some of the specific services are: full-time and part-time job vacancy lists, career counseling, programs on job-seeking skills including resumé assistance, a full library of literature on occupations and employers, and current information on government employment including testing dates and application forms. Seniors and alumni may also use the office to establish credential files for application to graduate schools and for employment. Two vacancy subscriptions are available to those unable to come to the Office: one summarizes Washington area jobs which is mailed weekly, another summarizes positions in education nationwide which is mailed bi-weekly. The office is open from 9 a.m. to 5 p.m. Monday through Friday, with evening hours scheduled during each semester. It is located at Woodhull House, 2035 G St., N.W.

SERVICES FOR STUDENTS WITH DISABILITIES

Information on these services is found on page 9.



Continuing Education for Women Center

The Continuing Education for Women Center offers programs which enable participants to prepare for new careers, qualify for job promotion, contribute effectively to community affairs, and enrich their own lives. Descriptive brochures on courses and other Center activities may be obtained by calling 676-7036 or writing to the Continuing Education for Women Center, George Washington University, 2130 H Street, N.W., Suite 621, Washington, D.C. 20052.

The Center services include: (1) group career development courses offered during the day and evening, (2) individual counseling services, (3) off-campus credit courses at convenient hours and locations, (4) noncredit courses, (5) career certificate programs, (6) academic advising for those enrolled or entering degree and nondegree programs offered by the Center, and (7) on-site courses and workshops especially designed for business and government agencies.

The Continuing Education for Women Center is accredited by the International Association of Counseling Services, Inc., an affiliate of the American Personnel and Guidance Association.

COUNSELING SERVICES

Developing New Horizons for Women (Career Development/Life Planning), a 10-session program which offers participants ways of gaining confidence and direction. They acquire self-understanding through interest and aptitude tests and introspective and experiential exercises; learn effective job-finding skills; assess career outlooks; examine educational opportunities; explore appropriate career and personal options; and develop skills in decision-making and implementation.

More than 5,000 persons, including business and professional, and international women, displaced homemakers, and young adults have been aided by the course in achieving their short- and long-range goals. Day and evening classes are offered at selected locations in Maryland and Virginia, as well as on the University campus.

Other group counseling courses offered by the Center are: Career Planning for Young Adults, Career Development for Men, Constructive Conflict, Developing New Horizons for International Women, Dynamic Aging, Job Search, Recreating a Single Life, Role Integration, Stress Management, and the Two-Career Family.

Individual career counseling is arranged by appointment. It includes a battery of tests, independent study, and individual conferences with a professional counselor.

Academic advising is provided by the professional staff of the Continuing Education for Women Center for those interested in enrolling in off-campus degree and nondegree credit programs. Counselors are available at designated locations on specified registration dates. Appointments can also be made for evening sessions at the Center by telephoning 676-7036.

OFF-CAMPUS CREDIT COURSES

The Continuing Education for Women Center offers off-campus credit courses at both the undergraduate and graduate levels. Qualified students may enroll in

these courses with either nondegree or degree status. Those who successfully complete courses as nondegree students are encouraged to apply for degree candidacy. Classes are held one day a week at churches and community centers in Virginia, Maryland, and the District of Columbia, during both day and evening hours. Each course carries three semester hours of credit.

Some students elect specific courses to qualify for positions in business and government; others select prerequisite courses to continue their studies or to meet specific degree requirements. Employers often provide tuition benefits and or release time to assist their employees in resuming or continuing academic study.

NONCREDIT COURSES

Selected noncredit courses and seminars, taught by academically and professionally qualified instructors, are offered during the day and evening by the Continuing Education for Women Center. These courses are offered on campus and in suburban locations. A list of courses includes: Effective Oral Communication, Effective Written Communication, Maximizing Energy and Health Through Nutrition, Free Lance Writing, More Than Just a Spectator: Drama Study for the Theatergoer, Introductory Calligraphy, How to Study, Law School Admission Test Review, Overcoming Math Anxiety, Women Administrators: Techniques for Success, Writing and Illustrating Children's Books, and Your Personal Fitness Plan. Interested persons will find new courses added each semester which will enrich leisure-time activities and improve academic, career, and communication skills.

Career Certificate Programs

LEGAL ASSISTANT PROGRAM

The Legal Assistant Program was established in 1972 in cooperation with the National Law Center. It has been approved by the American Bar Association. The basic program consists of a series of graduate-level courses designed to provide students with skills in legal research, writing, and analysis, and with an understanding of the basic concepts of substantive, administrative, and procedural law. The program may be completed on a part-time basis in one year or in an intensive 15-week session during the summer. Students who do not wish to enroll in the complete program may take selected courses. For admission to the one-year certificate program, an applicant must have a bachelor's degree or its equivalent in education and experience.

Courses offered include: Legal Research and Writing, Substantive Law, Civil Procedure, Estates and Trust Administration, Administrative Law, Legal Accounting, Legislative Process, Evidence, Real Property, Corporations, Legal Ethics.

PUBLICATION SPECIALIST PROGRAM

This is a one-year, graduate-level certificate program in publishing procedures, established in 1974. The program provides men and women with practical skills needed for careers in publishing and print communication. The main areas of study are (1) editing and copywriting; (2) printing, layout, and design; and (3) publication management. For admission to the program, an applicant must have a bachelor's degree or the equivalent in education and

xperience. Post-certificate courses in advanced publishing are offered to grad-ates and professionals in the field.

Courses offered include: Printing and Graphic Arts I, Graphics Tools and Techniques, Publication Design, Fundamentals of Editing and Writing, Maga-ine Design and Production, Publishing Finance and Accounting, Creative diting, Contemporary Book Publishing, Consumer Magazine Publishing, Audio-Visual Publishing, Book Design and Production, Printing and Graphic Arts II, The Magazine Editor, Association Publishing.

LANDSCAPE ARCHITECT ASSISTANT PROGRAM

In the spring of 1974 a 12-month certificate program in landscape and environmental design was initiated. The program concentrates on drafting and design, and includes a survey of plant materials, as well as lectures on the varied aspects of the professional's work. Projects in residential, recreational, and urban design are studied along with construction details and graphic ren-dering of plans. Classes taught by professional landscape architects and horti-culturists are open to both men and women. A college degree or equivalent education and experience is desirable for admission to the program.

Courses offered include: Drafting and Design I and II, Park and Recrea-tion Planning, Urban Site Design, and Plant Materials I, II, III, and IV.

FUND RAISING ADMINISTRATOR PROGRAM

This intensive 12-month certificate program provides the skills needed to succeed in a career in fund raising, development, and grantsmanship. Classes are taught by practicing professionals and are open to college graduates or those with the equivalent in education and experience. Courses are taken two evenings a week for two 16-week semesters and a five-week summer session. Individual courses may be taken on a space-available basis by those who do not wish to enroll in the complete program.

Courses offered include: The Comprehensive Funding System, Philan-thropy: History and Philosophy, Successful Fund Raising Literature, Marketing the Nonprofit Organization, Grantsmanship, Nonprofit Financial Management, Fund Raising in Specialized Settings, Planned Giving Programs, and Direct Mail Fund Raising.

SUPERVISORY SPECIALIST PROGRAM

One-year certificate programs in administration and supervision are available for persons preparing to advance in their current positions. These programs are designed to enhance the individual's background and experience. They include college credit courses, and administrative and supervisory noncredit workshops. The credit courses may be applicable toward an academic degree or may serve as prerequisites for further study. Courses meet evenings; work-shops are held on Saturdays. A certificate is granted upon completion of credit hours and six workshops.

MANAGERIAL DEVELOPMENT PROGRAM

The Managerial Development Program is a new intensive one-year certificate program designed to provide participants with an understanding of manage-ment theory, skills, and techniques. The program consists of a series of gradu-

ate-level courses in communications, financial planning, information systems, organizational relationships, and personnel administration. The faculty are academically qualified practicing professionals. Individual courses may be taken on a space-available basis by those who do not wish to enroll in the complete program. Applicants to the program must have a bachelor's degree or its equivalent in education and experience.

Courses offered include: Management Theories, Functions, and Techniques; Communications Skills for Managers; Modern Office Technology; Financial Planning and Control; Human Resources Management: Personnel Policies and Procedures; Realities of Administration in the Public Sector; or Realities of Administration in the Private Sector.

On-Site Courses and Workshops for Business and Government

The Continuing Education for Women Center provides on-site workshops and credit and noncredit courses for professional associations, businesses, and government agencies. These programs can be designed to meet specific needs and can be scheduled at the convenience of the sponsor. Employees may earn academic credit or Continuing Education Units, in addition to improving their job skills and interpersonal relationships. The courses and workshops may range from one to three days to several weeks.

Courses offered include: Career Development/Life Planning, Effective Communication, Time Management, Supervisory Skills, The Woman Manager, Conference Planning, Stress Management, Retirement Planning, Overcoming Math Anxiety, Report Writing, Accounting, Statistics, and English Composition. New courses can be developed to meet special requirements.

Columbian College of Arts and Sciences

The faculty of Columbian College of Arts and Sciences has academic jurisdiction over the degrees of Associate in Arts in General Studies; Associate in Science in Cartographic Science; Associate in Science in Geodesy; Bachelor of General Studies with areas of concentration in economics, history, mathematics, political science, psychology, and sociology; Bachelor of Science in Cartographic Science; Bachelor of Science in Geodesy; and Bachelor of Science in Oceanography. These off-campus programs are administered by the College of General Studies.

ADMISSION

For detailed information see "Admission as a Degree Candidate," page 16.

ACADEMIC WORKLOAD

A full-time undergraduate student in Columbian College of Arts and Sciences who is not on probation may not ordinarily take more than 17 semester hours. A student employed more than 20 hours a week, who is not on probation, may not take more than 10 hours.

A full-time undergraduate student who is a candidate for a degree in Columbian College of Arts and Sciences and who, during the immediately preceding semester, has received no grades below *B* and has earned grades of *A* in three courses totaling at least nine semester hours may take 18 or 19 hours. An employed undergraduate student who, during the immediately preceding semester, has no grades below *B* and has earned grades of *A* in two courses totaling at least six semester hours may take 12 hours.

A student on probation normally may not take more than three semester hours.

A student who accepts employment after registration or at any time during a semester must report that fact immediately to the dean so that the program may be adjusted, if necessary.

INCOMPLETE/AUTHORIZED WITHDRAWAL

Conditions under which the grades of *I* (Incomplete) or *W* (Authorized Withdrawal) may be assigned are described on page 30.

Removing an Incomplete.—In Columbian College of Arts and Sciences the grade of *I* must be removed no later than the last day of the examination period of the fall or spring semester immediately following the semester or summer session in which the grade of *I* is assigned. An "Incomplete" that is not removed within this period is automatically changed to an *F*. In cases of well-documented extenuating circumstances, an instructor and a student may jointly petition the Dean, or the appropriate committee, for additional time in which to complete the work of the course. Such petitions should be submitted within the same period. The grade of *I* cannot be removed by reregistering for the course here or by taking its equivalent elsewhere.

PROBATION

A student who in one semester receives two grades of *F* in courses carrying three or more semester hours of credit each, or the equivalent, is placed on probation. A student in the first semester on probation who receives one grade of *F* in such a course will be considered on probation for a second semester. Two grades of *D* will be treated as equivalent to one grade of *F* in determining probation. Any grades of *D* or *F* replacing earlier grades of *I* will be considered a part of the record for the semester during which the *I* is removed. A student on probation taking 12 or more semester hours whose grades are all *C* or better is removed from probation.

SUSPENSION

The following cases constitute grounds for suspension: (1) three grades of *F* in courses carrying three or more semester hours of credit or the equivalent. (2) two grades of *F* in such courses in the first semester on probation; (3) one grade of *F* in such courses in any later semester on probation. Two

---

The rules governing probation and suspension are applicable as stated to students enrolled for a full-time program (12 semester hours or more) during the fall or spring semester. Students enrolled for less than 12 semester hours during the fall or spring semester and students enrolled during the summer sessions are subject to probation or suspension on the basis of their record for 12 semester hours, or multiples thereof, rather than on their record in any one semester.

grades of *D* will be treated as equivalent to one grade of *F* in determining suspension. Any grades of *D* or *F* replacing earlier grades of *I* will be considered a part of the record for the semester during which the *I* is removed.

A student who is subject to probation for the third time, whether successive or after an interval, is suspended.

A student suspended for poor scholarship cannot register for courses even as an auditor. A student may apply for readmission after the lapse of either the fall or the spring semester. The student must then submit evidence to the Committee on Admission and Advanced Standing that he or she is better qualified to pursue college work. A student suspended twice for poor scholarship will not be readmitted.

USE OF CORRECT ENGLISH

Any student whose written or spoken English in any course is unsatisfactory may be reported by the instructor to the appropriate dean and to the Committee on the Use of Correct English. The chairman of the committee may assign supplementary work, without academic credit, varying in amount with the needs of the student. If the work prescribed is equivalent to a course, the regular tuition fee is charged. The granting of a degree may be delayed by failure to make up such deficiency in English to the satisfaction of the committee and the dean.

REQUIREMENTS FOR THE ASSOCIATE'S DEGREES

RESIDENCE

The last 18 semester hours must be completed in residence as a candidate for the Associate's degrees. A portion of the academic work taken to qualify for degree candidacy (see page 16) may be accepted in partial satisfaction of the residence requirement, if the courses are approved as part of the student's degree program.

REQUIREMENTS FOR THE BACHELOR'S DEGREES

RESIDENCE

The last 30 semester hours, including at least 12 hours in the area of concentration, must be completed in residence as a candidate for the degree sought. Unless special permission is granted by the appropriate dean to pursue work elsewhere, *the work of the senior year must be completed in residence.* This requirement applies to students transferring within the University as well as to students transferring from other institutions. The 15 hours taken in order to be considered for degree candidacy may be counted in residence. For regulations governing military students who are transferred when they are within six semester hours of their degrees, see page 33.

Transfers.— Transfer students from other colleges or universities must complete satisfactorily at least 12 semester hours of the required work in their area of concentration in residence as a candidate for the degree sought.

PROFESSIONAL COURSES

No more than 12 hours of professional courses, e.g., courses offered in units of the University other than Columbian College, may be included in the hours

required for the bachelor's degrees in Columbian College. Students electing professional courses under this rule must obtain the approval of the dean before registration.

ASSOCIATE IN ARTS IN GENERAL STUDIES

Faculty Advisor: John H. McCalla, College of General Studies; Building F, Room 2A; Telephone 676-7016.

Upon the satisfactory completion of the requirements set by Columbian College of Arts and Sciences, the degree of Associate in Arts in General Studies is conferred. Students who plan to continue working toward an off-campus bachelor's degree offered by Columbian College must apply to the dean upon completion of the requirements for the degree of Associate in Arts in General Studies. Forms for this purpose are available at the College of General Studies.

After completing the requirements for the degree of Associate in Arts in General Studies, students may wish to transfer to an on-campus degree program within the University, or they may wish to transfer to another institution. However, modifications in admission, advanced standing, and curriculum requirements permitted in the Associate in Arts in General Studies degree program may not be accepted in transfer. Therefore, while registered for this degree, students should meet the requirements of the college, school, or university to which they wish to transfer. The entrance requirements of the colleges and schools of the University are stated in this catalogue and in the *Undergraduate and Graduate Bulletin* of the University.

Scholarship.—The system of grading is described on pages 29–30. For regulations concerning probation, suspension, and readmission, see page 45.

Curriculum

The satisfactory completion of 60 semester hours of college work in the following curriculum is required. Students who plan to pursue a bachelor's degree are advised to plan their Associate's program so that they will satisfy the prerequisites to the degree of their choice.

	Semester Hours
COMMUNICATIONS	
Engl 9 or 10, 11	6
SpDr 1, 11, 111, or 121	3
HUMANITIES	
Nine semester hours selected from the following: Art 31–32, 71–72; Engl 43–44, 45–46, 51–52, 71–72; Mus 3, 4; Phil 50; Rel 9, 10, 59, 60	9
NATURAL AND MATHEMATICAL SCIENCES	
Three courses selected from the following: BiSc 3–4, 11–12; Chem 3–4, 5–6; Geol 1–2, 3, 4; Math 3, 6, 9, 10, 30, 31, 41, 42, 51, 52; Ocea 101, 102, 103–4; Phys 1, 2, 3, 4, 9–10; Stat 51, 54, 101–2	9–12
SOCIAL SCIENCES	
Nine semester hours are required, each course chosen from one of two departments, selected from the following: AmCv 71–72; Anth 1–2; Econ 1–2; Geog 51 and 52; Hist 39–40, 71–72; PSc 1 or 3, 2; Psyc 1, 8, 22, 29; Soc 1, 2	9
ELECTIVE	21–24
Total	60

BACHELOR OF GENERAL STUDIES

Faculty Advisor: John H. McCalla, College of General Studies; Building F, Room 104, Telephone 676-7016.

The Bachelor of General Studies curriculum aims to provide the adult part-time student with the opportunity to obtain a broad education. For that reason the course work required in the first and second years is distributed among communications (written and oral), the humanities, natural and mathematical sciences, and the social sciences. In choosing the third- and fourth-year course work required in departments related to their concentration, students should obtain counseling through the faculty advisor.

Students planning to work toward master's degrees are advised to plan their bachelor's programs so that they will meet the prerequisite requirements of the school or college of their choice. Students planning to enter graduate programs which require a reading knowledge of a foreign language are advised to include two years of one foreign language in their bachelor's program.

Scholarship.—To qualify for graduation, 120 hours of course work must be passed and an index achieved of 2.00 based on courses passed with grades of *A*, *B*, *C*, or *D*. The index is obtained by dividing the number of quality points by the number of semester hours of courses passed with grades of *A*, *B*, *C*, or *D*. Both the number of quality points and the number of semester hours of courses are based on the student's record at this University. The index is computed from a numerical equivalent assigned each grade: *A*, four points; *B*, three points; *C*, two points; *D*, one point, for each semester hour for which the student has registered. Courses marked *F*, *W*, *Z*, *I*, *IP*, *NC*, or *CR* are not considered in determining the index, though courses passed with *CR* count toward the 120 overall requirement. (When a formal grade is recorded for an Incomplete, the new grade will be included in the computation of the index. Grades in courses taken at another institution are not considered in computing the index.)

Students must also achieve no lower than the grade of *C* in required courses in the selected area of concentration. A *D* in a required course will satisfy a curricular requirement in the area of concentration and may count toward the total 120 hours, but it shall *not* count toward the minimum number of hours required in the area of concentration.

The system of grading is described on pages 29–30. For regulations concerning probation, suspension, and readmission, see page 45.

First and Second Years

	Semester Hours
COMMUNICATIONS	6
Engl 9 or 10, 11	3
Engl 20	3
SpDr 1, 11, 111, or 121	
HUMANITIES*	
Twelve semester hours selected from the following: Art 31–32, 71–72; Engl 43, 44, 45, 46, 51, 52, 71–72; Foreign Language (2 years of one language); Mus 3 and 4; Phil 50; Rel 9 and 10, 59, 60; Slav 91–92	12

* Students who plan to continue study for advanced degrees are urged to fulfill the 2-year language option

NATURAL AND MATHEMATICAL SCIENCES

Six to eight semester hours selected from the following: BiSc 3–4, 11–12; Chem 3–4, 5–6; Geol 1–2, or 3 and 4; Ocea 101, 102, 103–4; Phys 1 and 2, or 3 and 4, or 9–10	6–8
Six to eight semester hours selected from the following: Math 3, 6, 9, 10, 30, 31, 41, 42, 51, 52; Stat 51, 54, 101–2	6–8

SOCIAL SCIENCES

Twelve semester hours selected from two of the following combinations: AmCv 71–72; Anth 1–2; Econ 1–2; Geog 51 and 52; Hist 39–40, 71–72; PSc 1 and 2, 2 and 3; Psyc 1 and 8, 1 and 22, 1 and 29; Soc 1 and 2	12
ELECTIVES (depending on science option)	8–12
	60

Third and Fourth Years

Concentrations are offered in economics, history, mathematics, political science, psychology, and sociology.

CONCENTRATION REQUIREMENTS (to be selected in consultation with the faculty advisor):

100-level courses in the department of the selected area of concentration	24*
Courses in two or more related departments	18*
ELECTIVES	18*
Total	**120**

Associate in Science in Cartographic Science

Associate in Science in Geodesy

Bachelor of Science in Cartographic Science

Bachelor of Science in Geodesy

Bachelor of Science in Oceanography

Faculty Advisor: Hyman Orlin, Professorial Lecturer in Cartography, Geodesy, and Oceanography; Telephone 946-3557. Counseling by appointment only, Telephone 676-7000.

The course work in these two- and four-year curricula is offered both on and off campus. However, the cartography, geodesy, and oceanography courses are given only at selected off-campus locations. All of the required courses in the oceanography curriculum are not offered every year, full-time students who enter this curriculum must do so with the understanding that they may not be able to complete the degree requirements in four years. Students are advised

* Students selecting Psychology as an area of concentration are required to take 18 semester hours of 100-level Psychology courses; students selecting Sociology as an area of concentration are required to take 18 semester hours of 100-level Sociology courses. In both areas students must also take 24 semester hours of courses in two or more related departments.

to be sure they meet all prerequisites and register for courses in the prescribed sequence. Following is a listing of these off-campus locations, the distance from campus, and method of available transportation. Students attending these classes are expected to make their own arrangements for transportation. (Many students arrange private transportation on the first night of class.)

Facility	Distance in miles	Method of Transportation
NOAA-Gramax Building, 8060 13th Street, Silver Spring, Md.	9	Public
NOAA-Page Building, 2001 Wisconsin Avenue, N.W., Washington, D.C.	2	Public
NOAA-NBOC-2, 5640 Nicholson Lane, Rockville, Md., telephone 443-8626 for room assignments (Wisconsin Ave., Rt. 240)	20	Public
DMA-Hydrographic Office, Federal Office Bldg. No. 4, Suitland, Md.	12	Private
DMA-TOPO Command, 6101 MacArthur Blvd., N.W., Washington, D.C.	7	Public
U.S. Geological Survey, Reston, Va.	20	Private

Entrance requirements are stated on pages 16–19; residence requirements are stated on page 46.

The system of grading is described on pages 29–30. For regulations regarding probation, suspension, and readmission, see page 45.

The Associate in Science degree may be granted to a student who has completed 60 semester hours in courses listed under either the cartography or geodesy option. The Bachelor of Science degree may be granted to a student who has completed 120 hours in courses listed under either cartography, geodesy, or oceanography.

General Requirements

All candidates for the degree of Bachelor of Science will pursue a general arts and sciences curriculum until they begin work in their major field. Except for two general course requirements, all curriculum requirements leading to these degrees are established by the major field program.

The two general requirements are the following:

1. Each student must, during the freshman year, demonstrate adequate achievement in the field of English Composition, either by examination or by taking English 9 or 10 and English 11 or 12. This requirement may not be postponed.

2. Each student, at some point in the college career, must undertake a meaningful initiation into the three divisions of knowledge: humanities, natural and mathematical sciences, and social sciences. As each major field will represent one of these three areas, the requirement may be fulfilled by taking no less than six semester hours in each of the other two areas. These six credits may be in approved introductory courses, or in approved advanced courses if the student is qualified and receives the instructor's permission. Courses simply waived (no credit assigned) cannot satisfy the meaningful initiation requirements. Departments and programs are listed below under the three categories.

HUMANITIES

Art
*East Asian Languages and Literatures
English
*Germanic Languages and Literatures
Music
Philosophy
Religion
*Romance Languages and Literatures
*Slavic Languages and Literatures
Speech and Drama

NATURAL AND MATHEMATICAL SCIENCES

Biological Sciences
Cartography
Chemistry
Geodesy
Geology
Mathematics
Oceanography
Physics
Statistics

SOCIAL SCIENCES

American Civilization
Anthropology
Economics
Geography and Regional Science
History
Journalism
Political Science
Psychology
Sociology

ASSOCIATE IN SCIENCE IN CARTOGRAPHIC SCIENCE

The following requirements must be fulfilled:

1. The general requirements in English.
2. Prerequisite courses — Cart 1, 2.
3. Required courses in related areas — (a) Math 31, 32; (b) Geod 12, 17, 106; (c) At least two courses from Geology, Physics, Chemistry, or Oceanography.
4. Required courses in the major — Cart 102, 104, 111, 115, 116, and 125 or 126. To remain in good standing and to qualify for graduation, a student must maintain an average grade of *B* in required courses in the major.
5. Electives selected in consultation with the advisor. Recommended: Cart 107, 120, 121, 131; Geod 110, 117, 119, 150, 151.

ASSOCIATE IN SCIENCE IN GEODESY

The following requirements must be fulfilled:

1. The general requirements in English.
2. Prerequisite: Geod 17.
3. Required courses in related areas — (a) Math 31, 32, 33, 124; (b) Phys 1 or 3; (c) Cart 107.
4. Required courses in the major — Geod 106, 110, 150, 160, and at least one course from Geod 117 or 119, 151, 156, 161, 165-166. To remain in good standing and to qualify for graduation, a student must maintain an average grade of *B* in required courses in the major.
5. Electives selected in consultation with the advisor. Recommended: Math 139, 153, 157;† Phys 161;† Stat 157–58;† Ocea 101, 105, 110; Geol 1 or 3 or 21.†

BACHELOR OF SCIENCE IN CARTOGRAPHIC SCIENCE

The following requirements must be fulfilled:

1. The general requirements as stated above.

---

* Basic language courses (normally the first two years) are considered "tool studies" and are not acceptable in fulfillment of "meaningful initiation" in the humanities.

† Campus course. See the current *Undergraduate and Graduate Bulletin* for course description

2. Prerequisite courses — Cart 1, 2.
3. Required courses in related areas—(a) Math 31, 32, 33; (b) Geod 12, 13, 17, 18, 106, 110; (c) At least four courses from Geol 1 or 3 or 21,* Phys 1 or 3, 14,* 15,* Chem 11–12, Ocea 101–102 or 103–104.
4. Required courses in the major — Cart 102, 104, 107, 108, 111, 115, 116, 120, 121, 125 or 126, 131. To remain in good standing and to qualify for graduation, a student must maintain an average grade of *B* in required courses in the major.
5. Electives selected in consultation with the advisor. Recommended: Geod 117, 119, 150, 156; Cart 113, 128, 135; Phys 11–12;* Ocea 11, 105; Math 124, 153.

BACHELOR OF SCIENCE IN GEODESY

The following requirements must be fulfilled:

1. The general requirements as stated above.
2. Prerequisite courses — Geod 17, 18.
3. Required courses in related areas — (a) Phys 1 or 3 and 15;* (b) Math 31, 32, 33, 124; (c) Cart 107; (d) Geol 1 or 3 or 21;* (e) Ocea 101 and 102 or 103–104, 105.
4. Required courses in the major — Geod 106, 110, 150, 151, 160, 161, and at least 4 courses from Geod 117, 119, 156, 158, 165–166. To remain in good standing and to qualify for graduation, a student must maintain an average grade of *B* in required courses in the major.
5. Electives selected in consultation with the advisor. Recommended: Math 113,* 139, 140, 141,* 142,* 153, 157;* Ocea 110; Phys 161,* 162;* Stat 106,* 110,* 114,* 157–58.*
6. Students considering graduate studies should acquire a reading knowledge of either French, German, or Russian.

BACHELOR OF SCIENCE IN OCEANOGRAPHY

The following requirements must be fulfilled:

1. The general requirements as stated above.
2. Prerequisite courses—Ocea 11, 101 and 102.
3. Required courses in related areas — (a) At least two courses from each of the following: Biological Sciences, Chemistry, Geology and Physics; (b) Math 31, 32, 33; (c) Cart 107, 108.
4. Required courses in the major — Ocea 105, 106, 110, 112, 114, 115, 120 and at least three courses from Ocea 107, 111, 113, 122, 124, 130, 132, 135. To remain in good standing and to qualify for graduation, a student must maintain an average grade of *B* in required courses in the major.
5. Electives selected in consultation with the advisor.
6. Students considering graduate studies should acquire a reading knowledge of either French, German, or Russian.

* Campus course. See the current *Undergraduate and Graduate Bulletin* for course description.

SPECIAL DEGREE PROGRAMS

Servicemen's Opportunity College (SOC)

George Washington University has been designated a Servicemen's Opportunity College (SOC). SOC provides opportunities for active duty servicemen and women to pursue educational program goals through courses offered on base, in the evenings, on weekends, and at other nontraditional times. In support of the concept, George Washington University, while still maintaining its normal academic standards, assumes the responsibilities of meeting the educational needs of an individual serving in the Armed Forces. Provisions have been established whereby these individual needs can be met. Specifically, individuals who apply for admission as degree candidates for either the Associate's or Bachelor's degree from George Washington University's Columbian College of Arts and Sciences may, at their request, be designated as SOC students. Such students will be assured of a degree completion program through use of the agreement that follows:

AGREEMENT

George Washington University, a Servicemen's Opportunity College, agrees to the following:

I. Upon admission to Associate in Arts in General Studies or Bachelor of General Studies degree candidacy, the student may take the required course work either on or off campus. Regardless of where taken, courses of study taken while a degree candidate may be applied toward the degree sought, as a requirement or an approved elective. Although the grade of *D* is not acceptable for transfer, it may be used to satisfy a curriculum requirement. It may not, however, be counted toward the total number of semester hours required for the degree, and it should not be repeated. Courses will be taken from George Washington University unless the serviceman is transferred to a location not served by this University. In the case of transfer and in consideration of the student's future assignment, arrangements will be made between the student and the assigned counselor by the College of General Studies to ensure that the courses taken elsewhere satisfy the George Washington University program.

II. Academic credit may be obtained by any one or a combination of the following:

A. Registration as an on- or off-campus, full- or part-time student at this University.

B. Advanced standing for academic studies taken at other accredited institutions where such studies meet the requirements for the degree, or by examination. (A maximum of 42 semester hours allowed for the associate's degree; a maximum of 90 semester hours allowed for the bachelor's degree.)

Within the maximum of 42 hours of credit allowed for advanced standing toward the Associate in Arts in General Studies degree, a maximum of 30 hours may be obtained by any one or combination of the methods below. Within the maximum of 90 hours of credit allowed for advanced standing toward the Bachelor of General Studies degree, a maximum of 60 hours may be obtained by any one or combination of the methods below.

1. *College-Level Examination Program (CLEP) Subject Examinations.*—CLEP Subject Examinations are offered in more than 20 subject areas. These

tests measure achievement in the equivalent of specific college-level courses. (Credit may not be earned by passing the examination after having taken the equivalent course.) Maximum credit allowed for Associate's degree, 30 semester hours; maximum allowed for Bachelor's degree, 60 semester hours. A candidate for a degree from any school at this University must seek departmental approval *prior* to taking the examination in order to receive credit for a CLEP Subject Examination. (Credit—advanced standing—is not given for the college algebra-calculus, and college algebra-trigonometry subject examinations.)

2. *College-Level Examination (CLEP) General Examinations.*—CLEP General Examinations are offered in five areas: mathematics; social sciences; humanities; natural sciences; and English composition. (Credit—advanced standing—is not given for the General Tests in English composition and mathematics.) Maximum credit allowed, 18 semester hours.

3. *Columbian College of Arts and Sciences Special Departmental Examinations.*—A student may request any department of Columbian College to offer a special examination covering the subject matter of any specific course. (If an appropriate CLEP Subject Examination is available, the department may choose to employ it.) The student who performs satisfactorily may receive credit (advanced standing), waiver of requirement, or both, at the discretion of the department. (A student who has previously taken examinations to waive course requirements may not, however, at a later time take examinations for credit in the same courses.) Special departmental examinations will normally be of at least three hours' duration. A fee of $25 for each course examination is charged for preparing, administering, and grading. Maximum credit allowed for Associate's degree, 30 semester hours; maximum allowed for Bachelor's degree, 60 semester hours.

4. *Service Schools.*—A maximum of 30 (or a maximum of 12 hours if the courses are "professional") semester hours may be obtained on the basis of service schools satisfactorily completed, as evaluated in accordance with the "Guide to the Evaluation of Educational Experience in the Armed Forces," issued by the Committee on Accreditation of Service Experience. Ordinarily such subjects are counted as electives. No credit will be allowed for military experience as such.

5. *Correspondence Courses.*—A maximum of 15 semester hours may be earned through the successful completion of correspondence courses of college level which are offered by the U.S. Armed Forces Institute or a regionally accredited college or university.

III. The minimum requirement for the Associate in Arts in General Studies degree is 60 semester hours; the minimum requirement for the Bachelor of General Studies degree is 120 semester hours. A minimum of 18 semester hours for the Associate's degree and a minimum of 30 hours for the Bachelor's degree must be completed at George Washington University, but may be completed at any point in the student's program of study. At least 6 semester hours in the selected area of concentration must be taken at this University.

IV. The College of General Studies will handle and coordinate administrative matters and be the point of contact with the college granting the degree. The provisions as stated in the *College of General Studies Bulletin* will apply in all cases not specifically mentioned in this agreement.

V. Tuition and fees will be as stipulated in the *College of General Studies Bulletin* on a year-to-year basis.

VI. Students accepted under this program are subject to the probation and suspension regulations of the University, and are required to maintain scholastic standards.

VII. In addition to trained counselors, University representatives are assigned to each installation to assist in the counseling function.

Accelerated Degree Completion Program

The Accelerated Degree Completion Program is available at the Washington Navy Yard in the District of Columbia.

This accelerated program may permit an individual to complete the degree of Associate in Arts in General Studies or Bachelor of General Studies in approximately 20 months through part-time study. Time to complete the program will vary according to the amount of advanced standing granted through transfer of credit or by examination and according to the number of courses the student is enrolled in. The program is designed for the highly motivated individual who must complete a program of study in a limited period of time. Courses are seven weeks in length; two nights a week.

Graduate School of Arts and Sciences

The faculty of the Graduate School of Arts and Sciences has academic jurisdiction over the degrees of Master of Arts in the field of Religion and Medical Care, Master of Arts in Special Studies, and Master of Science in Special Studies. When offered at off-campus locations these programs are administered by the College of General Studies.

MASTER OF ARTS

THE DEGREE OF MASTER OF ARTS with a field in Religion and Medical Care is a degree program offered by the Graduate School of Arts and Sciences under the direction of the Department of Religion.

The program of study is interdisciplinary and combines both professional and academic work. The intent of the program is (1) to provide training in an academic graduate milieu of chaplains and clergymen whose professional effectiveness might be increased through the combination of clinical experience and academic study; (2) to provide a program of study for those medical students who have a sense of the significance of theological insights for the care of the whole person and who desire to combine their medical education with this correlative study; and (3) to provide a program of research and study in the area of religion and medical care for those whose theological training (e.g., in ethics or sociology of religion) and interest are directed toward a vocation in teaching. Support for the program comes from (1) clinical training programs of the National Naval Medical Center, National Institutes of Health, and Walter Reed General Hospital; and (2) the departments of Health Care

Administration, Psychology, Religion, and Sociology, and departments of the School of Medicine and Health Sciences.

The program of study leading to the degree of Master of Arts in the field of Religion and Medical Care consists of 36 semester hours of approved course work with or without a thesis and the passing of a Master's Comprehensive Examination.

For information concerning admission requirements and the specific requirements for the degree, contact the Graduate School of Arts and Sciences or the chairman of the Department of Religion.

MASTER OF ARTS IN SPECIAL STUDIES AND MASTER OF SCIENCE IN SPECIAL STUDIES

These degree programs provide a course of study appropriate to those students who wish to emphasize interdisciplinary work. They are offered both on and off campus. The off-campus programs can only be offered for a group of students with mutual educational goals. The programs allow a maximum of flexibility; however, they must be developed around identified objectives and must provide a structured sequence of study toward these goals. University representatives will work with interested groups to develop suitable programs. The contemplated curriculum must be approved prior to admission to the Graduate School. A student interested in interdisciplinary work leading to one of these degrees who is not in a group program must register on campus.

For detailed information on the regulations of the Graduate School of Arts and Sciences, see the *Handbook for Graduate Students* and the *Undergraduate and Graduate Bulletin*, available at the office of the dean of the Graduate School of Arts and Sciences.

Academic Workload

A full-time student in the Graduate School of Arts and Sciences registers for nine to 12 semester hours each semester; a part-time student must register for six semester hours each semester. These requirements do not apply when a student has fewer than nine semester hours (full-time) or six semester hours (part-time) remaining to complete the program. No student may take more than 15 semester hours during any one semester.

Admission

For detailed information, see "Admissions as a Degree Candidate," page 16, and page 20.

Requirements for the Degrees

The program of study consists of 36 semester hours of course work including a majority of courses in the arts and sciences (e.g., economics, natural sciences, political science, psychology, sociology, statistics), with not more than one-third from any single department. *There are no thesis or tool requirements.* Advanced undergraduate courses (those numbered 101–200) may be included in the program of study upon the approval of the Graduate School and with the provision that students complete additional work for graduate credit.

Each program of study must be approved by the dean of the Graduate School of Arts and Sciences and the program advisors.

RESIDENCE

A minimum of 27 semester hours must be completed after admission to Master's degree candidacy.

SCHOLARSHIP

Graduate students are expected to maintain a minimum accumulative grade average of *B* (3.00) in all course work in the program of studies. Individual departments may require a higher average.

In the case of a student who receives a grade of *F* for a course in his program of studies, the Graduate School will require a departmentally approved written statement justifying the student's continuance in the Graduate School and outlining the program to be followed. Continuation is contingent upon the dean's approval. When a grade of *F* is received for a course in the program of studies, the grade is included in the student's grade point average whether or not the course is repeated.

INCOMPLETE/AUTHORIZED WITHDRAWAL

Conditions under which the grades of *I* (Incomplete), *IP* (Progress), *W* (Authorized Withdrawal) and *Z* (Unauthorized Withdrawal) may be assigned are described on page 30.

Removing an Incomplete.—An "Incomplete" must be made up before the lapse of one calendar year. An "Incomplete" which is not removed within one calendar year remains as a grade of *I* on the student's record. The grade of *I* cannot be removed by reregistering for the course here, or by taking its equivalent elsewhere.

MASTER'S COMPREHENSIVE EXAMINATION

Master's degree candidates must pass a Master's Comprehensive Examination administered by the Graduate School of Arts and Sciences.

A student who fails to pass the Master's Comprehensive Examination may, in exceptional circumstances, and with the approval of the department and the dean, repeat the examination at the next scheduled date. If the exam is failed a second time, no further opportunity to take the examination is permitted.

Withdrawal

Graduate students who intend to withdraw from the Graduate School of Arts and Sciences should inform the School in writing. The last day for complete withdrawal without academic penalty is at the end of the eighth week of classes.

Leave of Absence

A student who is temporarily unable to continue the program of studies may request leave of absence for a specific period of time, not to exceed one calendar year during the total period of degree candidacy. When the period of leave has expired, it is the student's responsibility to notify the Graduate School at least two months in advance of a given registration period of the intention to re-register. If a student fails to re-register, candidacy is terminated.

SPECIAL DEGREE PROGRAMS

Master of Arts in Special Studies (Criminal Justice)

A program of study leading to the degree of Master of Arts in Special Studies with a concentration in criminal justice is offered off campus by the Graduate School of Arts and Sciences. This interdisciplinary degree program consists of study in criminology, forensic sciences, law, management sciences, psychology, and sociology, and is particularly appropriate for law enforcement personnel or for students considering a career in law enforcement. For further information, contact one of the following: Charles E. O'Rear, Chairman of the Department of Forensic Sciences, telephone 676–7319; the Office of the Dean of the Graduate School of Arts and Sciences, telephone 676–6210; or College of General Studies Staff Members—I. Ralph DeBelles, Manager of District of Columbia Programs, telephone 676–7061; Douglas Carter, Manager of Maryland Programs, telephone 676–7022; Russell Lloyd Jr., Manager of Virginia Programs, telephone 676–7040.

Master of Arts in Special Studies (Legislative Affairs)

A program of study leading to the degree of Master of Arts in Special Studies with a concentration in legislative affairs is offered off campus by the Graduate School of Arts and Sciences. The program, focusing on the Congress of the United States, includes course work in legislative theory and research, the processes of politics, and public policy analysis. For further information, contact the Office of the Dean of the Graduate School of Arts and Sciences, telephone 676–6210, or Nancy Berns, Education Specialist, College of General Studies, telephone 676–7067.

Master of Arts in Special Studies (Social and Organizational Behavior)

A program of study, developed by the Graduate School of Arts and Sciences, which is interdisciplinary, emphasizing work in psychology, sociology, and human resources development. It is designed to provide participants with a conceptual framework for understanding interpersonal and social relationships, particularly within an organizational setting, an appreciation for the role of effective communication and a knowledge of techniques of counseling and group facilitation; an understanding of the sociology of work, and of its impact on organizational structure, personnel retention, program development and career growth, and a background in social systems, the nature of leadership, and the process of organizational change. For further information, contact the Office of the Dean of the Graduate School of Arts and Sciences, telephone 676–6210, or Nancy Berns, Education Specialist, College of General Studies, telephone 676–7067.

Master of Arts in Special Studies (Urban Learning)

The program of study leading to the degree of Master of Arts in Special Studies with a concentration in urban learning is offered off campus by the Graduate School of Arts and Sciences. The curriculum is designed to improve the urban educator's and city teacher's understanding of the environment in which he or she operates, with emphasis on social problems. For further information, contact the Office of the Dean of the Graduate School of Arts and Sciences, tele-

phone 676–6210, or Norma Calhoun, Education Specialist, College of General Studies, telephone 676–7023.

Master of Science in Special Studies (Environmental Science)

A program of study leading to the degree of Master of Science in Special Studies with a concentration in environmental science is offered off campus by the Graduate School of Arts and Sciences. The curriculum is designed to improve the student's understanding of the environment in which he or she operates with emphasis on problems of the work place. It includes industrial hygiene and health, environmental impacts, economics and resource management, technology and public policy, and biostatistics. The course of study was developed in cooperation with Department of Labor officials to meet the professional requirements of personnel in the occupational safety and health fields. For further information contact the Office of the Dean of the Graduate School of Arts and Sciences, telephone 676–6210; or College of General Studies Staff Members— I. Ralph DeBelles, Manager of District of Columbia Programs, telephone 676–7061; Douglas Carter, Manager of Maryland Programs, telephone 676–7022; Russell Lloyd, Jr., Manager of Virginia Programs, telephone 676–7040.

Master of Science in Special Studies (Human Resource Studies)

A program of study leading to the degree of Master of Science in Special Studies with a concentration in human resource studies is offered on campus on weekends. The program gives students a broad base in economic policy, social and behavioral theory, management theory and practice, and public policy analysis, and seeks to provide policy analysts and management specialists an opportunity to explore new conceptual developments and innovations where traditional theories and earlier techniques are proving inadequate. Courses are scheduled at the University campus two weekends each month, Friday evening and all day Saturday, over a two year period. For further information contact the Office of the Dean of the Graduate School of Arts and Sciences, telephone 676–6210; or Hal Serven, Education Specialist, College of General Studies, telephone 676–7028.

Master of Science in Special Studies (Oral Biology)

In cooperation with the Army Institute of Dental Research of the Walter Reed Army Medical Center, a program of study leading to the degree of Master of Science in Special Studies with a concentration in oral biology is offered by the Graduate School of Arts and Sciences. The program is open to dental officers serving on active duty with the U.S. Armed Forces or with other federal agencies. For further information, contact the Office of the Dean of the Graduate School of Arts and Sciences, telephone 676-6210, or Edward B. Wright, Education Specialist, College of General Studies, 676–7024.

Master of Science in Special Studies (Social and Economic Statistics)

A program of study leading to the degree of Master of Science in Special Studies with a concentration in social and economic statistics is offered off campus by the Graduate School of Arts and Sciences. The program is offered only to students at the International Statistical Program Center of the U.S.

Bureau of the Census. It is designed to give a knowledge of the theories, co cepts, principles, and literature of social and economic statistics, and bac ground and management leadership in staff development as it relates to pla ning and implementation of statistical analyses. The curriculum includ demographic and statistical methods, management and organization, and eco nomic and social development. For further information contact the Office the Dean of the Graduate School of Arts and Sciences, telephone 676-6210

Master of Science in Special Studies (Telecommunication Operations)

A program of study leading to the degree of Master of Science in Spec Studies with a concentration in telecommunication operations is offered o campus by the Graduate School of Arts and Sciences. This program is de signed to introduce personnel with technical backgrounds in communication to related work in the field of business administration, economics, manage ment science, political science, sociology, and statistics. For further infor mation, contact the Office of the Dean of the Graduate School of Arts an Sciences, telephone 676–6210, or one of the following College of General Stud ies Staff Members—I. Ralph DeBelles, Manager of District of Columbia Pro grams, telephone 676 7061; Douglas Carter, Manager of Maryland Programs telephone 676 7022; Russell Lloyd, Jr., Manager of Virginia Programs, tele phone 676–7040.

School of Engineering and Applied Science

Associate Director, Joint Institute for Advancement of Flight Sciences, NASA-Lang ley Graduate Program: S.W. Yuan, Professor of Engineering and Applied Scienc Tompkins 306, Telephone 676-6665

Program Advisor of Coastal Engineering Research Center, Fort Belvoir, Va.: J.E. Fein, Professor of Civil Engineering, Tompkins 109, Telephone 676-7179

The faculty of the School of Engineering and Applied Science has academ jurisdiction over the Master of Science, Master of Engineering Administration Professional Degree, and Doctor of Science degree programs. When offered a off-campus locations, these programs are administered by the College of Gen eral Studies.

MASTER OF SCIENCE

The School of Engineering and Applied Science in cooperation with the Na tional Aeronautics and Space Administration's Langley Research Center, has a full-resident graduate engineering program at NASA-Langley, in Hampton, Va. NASA-Langley's extensive scientific and engineering facilities and equip ment are utilized whenever feasible.

The program at NASA-Langley leads to the degree of Master of Science in the fields of acoustics, aeronautics, environmental modeling, structures and dy namics, flight sciences, fluid mechanics and thermal sciences, solid mechanics and materials engineering, and electrical engineering and computer science. These programs are open to qualified NASA employees and area residents

With the approval of the instructor, courses may be taken in nondegree status.

Programs in both electrical engineering and computer science are offered at the Westinghouse Defense and Electronic Systems Center, Baltimore, Md., and in computer science at the Naval Air Station, Patuxent River, Md.

Admission

For detailed information see "Admissions as a Degree Candidate," page 16, and pages 20–21.

Requirements for the Degree

The minimum Master's degree program consists of 24 semester hours of approved graduate courses and a Master's thesis (equivalent to six semester hours). With the approval of the department the student may elect an optional program without a thesis which consists of a minimum of 33 semester hours of approved graduate courses. All Master's candidates are required to pass a Master's Comprehensive Examination. Students whose undergraduate study does not include necessary prerequisites may be required to take more than the minimum semester hours required.

Upon admission the student is assigned an advisor. Programs of study are determined by any prerequisites established and by the requirements of the department in which the student wishes to study. The program of studies in preparation for the Master's Comprehensive Examination must be approved by the student's advisor and the appropriate department chairman.

SCHOLARSHIP

Grades are indicated as *A*, Excellent; *B*, Good; *C*, Minimum Pass; *F*, Fail; and *CR*, Credit for satisfactory thesis completion. Whenever a grade is not assigned, the symbol *I* (Incomplete) or the symbol *W* (Authorized Withdrawal) is recorded. Students who receive two grades of *F*, or three grades below *B*, are barred from further enrollment in graduate courses and, ordinarily, will not be readmitted to graduate study.

GRADUATION REQUIREMENTS

Non-thesis Option.—A student may graduate with either:

1. 33 course credit hours of *B* or better with no more than two grades below *B* of which only one *F* is permitted; or
2. A 3.00 quality-point index with a minimum of 33 course credit hours with no more than two grades below *B* of which only one *F* is permitted.

Thesis Option.—In addition to 6 credit hours of acceptable thesis, a student may graduate with either:

1. 24 course credit hours of *B* or better with no more than two grades below *B* of which only one *F* is permitted; or
2. A 3.00 quality-point index with a minimum of 24 course credit hours with no more than two grades below *B* of which only one *F* is permitted.

INCOMPLETE/AUTHORIZED WITHDRAWAL

Conditions under which the grades of *I* (Incomplete) and *W* (Authorized Withdrawal) may be assigned are described on page 30.

Removing an Incomplete.—Although the grade of *I may* remain on the records for a maximum of one year, the instructor should normally set a much briefer period within which the uncompleted work must be made up. The grade of *I* cannot be removed by reregistering for the course here, or by taking its equivalent elsewhere. An incomplete which is not removed within one calendar year is automatically changed to an *F*.

RESIDENCE

All work for the degree must be done in residence except when special permission is granted by the chairman of the department.

MASTER'S THESIS

In those programs requiring a thesis, the degree candidate must submit an acceptable thesis to demonstrate the ability to make independent use of the knowledge and discipline of thought acquired and developed by graduate study, to furnish objective evidence of constructive power in a given field, and to demonstrate the ability to communicate the results of the work in writing. Work of a suitable character for which the student has professional responsibility may be considered, whether done on or off campus, provided no significant amount of work is completed without supervision.

As a part of registration for the thesis course 299, the candidate must submit the thesis area to the appropriate department chairman, on the form obtainable at the School office and approved by the faculty advisor. The thesis title must be submitted to the dean, on the form available in the School office, at the beginning of the semester in which graduation is expected. Registration in thesis 299–300 entitles the student, during such registration, to the advice of the member of the faculty under whom the thesis is to be written. The student may consult the advisor, but the thesis is the exclusive responsibility of the student.

The thesis in final form must be submitted to the appropriate department chairman by the date stated in the calendar for the semester in which the candidate enrolls in thesis 300. In case a thesis is unfinished on the date specified, the student may be granted an additional semester. If the preparation of the thesis extends beyond the three semesters, approval for an extension of time will be required and the student must reregister for thesis 300 and pay tuition as for a repeated course.

A thesis may be submitted in final form one time. The acceptability of the thesis is determined exclusively by the Master's Comprehensive Examination committee. If the thesis is unacceptable, the student's graduate status is terminated.

Printed copies of detailed regulations regarding the form and reproduction of the thesis are available in the Office of the School. Accepted theses, with accompanying drawings, become the property of the University and are deposited in the University Library, where the duplicate copies are bound and made available for circulation.

OPTIONAL MASTER'S PROGRAM WITHOUT A THESIS

With the approval of the department, the student may elect an optional program without a thesis which consists of a minimum of 33 semester hours of approved graduate courses.

MASTER'S COMPREHENSIVE EXAMINATION

After completing the prescribed program, the student must pass a Master's Comprehensive Examination to demonstrate substantial understanding of principles and methods and their use in the area of interest. This examination may be written, oral, or both. A graduate student who fails any portion of the Master's Comprehensive Examination on the first attempt may be examined one more time if approval is given by the appropriate Examining Committee. In the event of failure to complete the examination satisfactorily, the student's graduate status terminates.

TIME TO COMPLETE MASTER'S DEGREE REQUIREMENTS

A full-time student in the Master's program is allowed a maximum of three calendar years to complete all degree requirements, from the date of the student's first graduate-student status registration in prerequisite or graduate courses. A part-time student in the Master's program is allowed a maximum of five calendar years. The time limit does not include any period of registration as an unclassified student before admission to graduate student status, nor does it encompass any specified period spent on approved leave of absence. Readmission is required upon expiration of leave of absence under the conditions and requirements then prevailing.

Students who do not complete degree requirements within the allowed time have their graduate status terminated. They may be readmitted to graduate status under conditions specified by the department chairman and approved by the dean.

MASTER OF ENGINEERING ADMINISTRATION

The School of Engineering and Applied Science, in cooperation with Aberdeen Proving Ground, Md.; Aeronautical Radio, Inc., Annapolis, Md.; the Fairfax County Government, Fairfax, Va.; Goddard Space Flight Center, Greenbelt, Md.; Hunt Valley Industrial Complex, Cockeysville, Md.; Central Virginia Industries, Lynchburg, Va.; NASA-Langley Research Center, Hampton, Va.; Naval Ordnance Station, Indianhead, Md.; and Richard Montgomery High School, Rockville, Md., offers a graduate program leading to the degree of Master of Engineering Administration. The program is open to employees of these organizations and area residents.

Admission

For detailed information see "Admission as a Degree Candidate," page 16, and pages 20–21.

Requirements for the Degree

The requirements for the degree of Master of Engineering Administration are the same as those listed under the degree of Master of Science.

PROFESSIONAL DEGREE PROGRAM*

The School of Engineering and Applied Science has established the Professional degree program to provide an educational program for those students who are interested in pursuing course work beyond the master's degree, with emphasis on applied subject material rather than on basic research.

Successful completion of the Professional degree program leads to the degree of Engineer or the degree of Applied Scientist.

In the Professional degree program, the School adheres to the educational philosophy of increasing knowledge and understanding of the individual by concentration on principles and their application. This approach is intended to provide students a technical flexibility for successful adaptation to rapidly changing technology. Each program is individually planned according to the student's background and needs and is subject to departmental requirements. This program has been designed to satisfy the needs of industry and government for highly trained and educated technical personnel in engineering and applied science.

Courses in the fields of electrical engineering and computer science are offered at the Westinghouse Defense and Electronics Systems Center, Baltimore, Md. It should be noted, however, that some courses in this program are offered only on campus.

Admission

For detailed information see "Admission as a Degree Candidate," page 16, and page 21.

REQUIREMENTS

1. *Engineer.*—To study toward the degree of Engineer, an applicant must possess a bachelor's degree and a master's degree in the area of engineering.

2. *Applied Scientist.*—To study toward the degree of Applied Scientist, an applicant must possess a bachelor's degree in engineering, mathematics, or natural science; and a master's degree in engineering, natural science, mathematics, or administration. Applicants having an equivalent quantitative background may be considered as special cases by the respective departments.

Scholarship

No student studying for the Professional degree may receive more than two course grades below *B*. If more than two course grades below *B* are received, study is terminated and further enrollment is prohibited. A student must achieve a final quality-point average of 3.00 to receive the degree.

DOCTOR OF SCIENCE*

The Doctor of Science degree program offered by the School of Engineering and Applied Science is designed to prepare the student for a career of creative scholarship by providing a broad but balanced background of knowledge and guidance in the performance of research. It requires study of interrelated fields of learning as well as original research in the field of central interest. The doctoral program for each student is determined, on an individual basis, by the student and the advisor. Work for the doctoral degree must be done in resi-

* Complete information on the Professional degrees, and the Doctor of Science programs, contained in the *School of Engineering and Applied Science Bulletin*

dence on campus except when special permission is granted by the chairman of the department.

Admission

For detailed information see "Admission as a Degree Candidate," page 16, and page 22.

Requirements for the Degree

The program of study for the degree of Doctor of Science is divided into two stages. The first—made up of a study of interrelated fields of learning which supports the general area of research concentration—culminates in the qualifying examination. The second—composed of research investigation of a particular subject in a special field and the presentation of such research findings in a written dissertation—culminates in the final examination. The general requirements for the Doctor of Science degree are (1) a minimum of 30 semester hours of credit in a formal program at the graduate level beyond the master's degree in preparation for the qualifying examination; (2) a reading knowledge of one foreign language, preferably Russian; (3) the satisfactory completion of the qualifying examination; (4) a dissertation, equivalent to a minimum of 24 semester hours; and (5) the satisfactory passing of the final oral examination.

The candidate must submit to the appropriate department five complete copies of the dissertation and an abstract (not to exceed 600 words) of the dissertation no later than the date specified in the calendar. The abstract is included in the announcement of the examination and is reproduced by University Microfilms, Inc. One copy of the dissertation is also sent to University Microfilms, Inc.

Printed copies of detailed regulations regarding the form and reproduction of the dissertation, preparation of the abstract, and services offered by University Microfilms, Inc., are available at the School office. The successful candidate for the doctorate is required, before receiving the degree, to pay a fee to cover a part of the expense of printing the abstract of the dissertation, and for the basic service rendered by University Microfilms, Inc. Accepted dissertations, with accompanying drawings, become the property of the University and are deposited in the University Library where bound copies are available for circulation.

LANGUAGE REQUIREMENT

A doctoral student should maintain a broad outlook as he pursues his study, and therefore must have the capability of reading appropriate literature published in a foreign language. Accordingly, a reading knowledge of one foreign language, preferably Russian, must be demonstrated before admission to the qualifying examination. If the student wishes to satisfy this requirement with a language other than Russian, approval must be obtained from the doctoral advisor and the department chairman; permission to use a language other than Russian will be granted on the basis of its importance to the student's field of interest.

TOOL REQUIREMENT

In addition to the language requirement, an examination in a tool requirement (i.e., computer programming) may be established by the various departments.

SCHOLARSHIP

To be admitted to the qualifying examination, the doctoral student must achi an overall academic average of 3.20 on a scale of 4 (a grade of *A* equals points; *B*, 3 points; *C*, 2 points; and *F*, 0 points). No doctoral student may ceive more than two course grades below *B*. If more than two course grades below *B* are received, his graduate study is terminated and his further enro ment prohibited. Courses in which the student earns grades below *B* are included in the total semester-hour requirement for the degree. A student w receives any grade below *B* is required to consult with the advisor for a r view of the student's program of study and discussion of possible change therein.

School of Education and Human Development

The faculty of the School of Education and Human Development has academ jurisdiction over the Master of Arts in Education and the Education Specia degrees. When offered at off-campus locations these programs are administered by the College of General Studies.

Academic Workload

A student registered in the School of Education and Human Developme may enroll for nine semester hours or more if attending on a full-time basi The maximum permissible load for a part-time student is six semester hours.

Suspension

Graduate Suspension in the School of Education and Human Development.— A student who receives the grade of *C* in more than six semester hours of work is subject to suspension. A student who receives a grade of *F* must confer with the dean before enrollment for further work.

MASTER OF ARTS IN EDUCATION

Master of Arts in Education off-campus degree programs are designed for edu cators who wish to increase their knowledge of professional and academic in formation and to prepare for special types of educational service in public and private schools. They are also designed to further the preparation of indi viduals for non-traditional areas of education in both the public and private sectors of society, regardless of clientele, age, or institutional base.

The Master of Arts in Education degree programs offered at off-campus centers are available in the following fields: elementary education; higher edu cation; human resource development; secondary education; early childhood special education; supervision and human relations; reading; generic counsel ing; and vocational/special education.

Admission

For detailed information see "Admission as a Degree Candidate," page 16, and page 19.

Requirements for the Degree

The program of study consists of a minimum of 33, 39, or 42 semester hours of course work in core courses, depending upon the chosen field. The thesis (equivalent to six semester hours) is optional.

RESIDENCE

Advanced standing is granted for approved courses taken at other accredited institutions; however, a minimum of 24 semester hours must be completed at this University, with no less than 21 semester hours completed after admission to Master's degree candidacy.

SCHOLARSHIP

A quality-point index of 3.00 is required for graduation. Students who receive a grade of *C* in more than two courses are subject to suspension. Students who receive a grade of *F* must confer with the dean of the School of Education and Human Development before enrollment for further work.

INCOMPLETE/AUTHORIZED WITHDRAWAL

Conditions under which the grades of *I* (Incomplete) or *W* (Authorized Withdrawal) may be assigned are described on page 30.

Removing an Incomplete.—The grade of *I may* remain on the record indefinitely unless changed by action of the instructor who assigned the grade. At any time it is deemed appropriate, the grade may be changed and a grade of *F* assigned if the requirements of the course or seminar have not been completed. When a grade of *I* is assigned, the instructor will either notify or furnish with the student a terminal date for completion of the requirements.

THE THESIS

Students who elect a thesis must register on campus for Educ 299–300. The choice of the thesis subject must be approved in writing by the student's adviser and filed in the office of the dean. A statement of the School of Education and Human Development standards for the thesis and printed copies of detailed regulations regarding the form and reproduction of the thesis are available in the office of the dean.

Payment of tuition for the thesis course entitles the candidate, during the period of registration, to the advice and direction of the member of the faculty under whom the thesis is to be written. In case a thesis is unfinished, additional time may be granted. The student must, however, be enrolled continuously in the program (see page 32). If the preparation of the thesis extends beyond the additional time granted, the student must register for the entire six hours of thesis again and pay tuition as for a repeated course.

TAKING COURSES ON CAMPUS

A student registered in a degree program off campus who wishes to register for a course on campus, *must* file a formal graduate application which may be obtained from the office of the dean of the School of Education and Human Development.

MASTER'S COMPREHENSIVE EXAMINATION

In addition to the course examinations, the candidate may be required to pass a special three-hour comprehensive examination in the area of specialization. Candidates for the examination must be registered for the semester during which it is to be taken, and must file a written application in the office of the dean of the School of Education and Human Development no later than 30 days prior to the date of the examination. Degree candidates in programs requiring 33 semester hours may, with the approval of their academic advisor, take an additional three-semester-hour course in lieu of a comprehensive examination. Degree candidates in programs requiring 36 semester hours or more may waive the comprehensive examination with the approval of the academic advisor.

EDUCATION SPECIALIST

The School of Education and Human Development provides off-campus programs of advanced study leading to the degree of Education Specialist in the fields of administration and higher education. The program is for students with master's degrees in education who seek further professional preparation.

Admission

For detailed information see "Admission as a Degree Candidate," pages 20 and 21.

Requirements for the Degree

A minimum of 30 semester hours beyond the requirements for the degree of Master of Arts in Education is required. At least 21 hours of this work must be in courses offered by this University, on campus or in the approved off-campus degree center to which the candidate has been admitted; with the approval of the advisor, the remaining semester hours of the program may be taken at another approved university. A maximum of five calendar years is allowed for completion of the program. At least 12 of the required 30 hours must be in appropriate graduate courses in education selected from the following areas: (1) foundations and cognate study, (2) background and general principles of the field of study, (3) an area of specialization.

SCHOLARSHIP

Scholarship requirements for the degree of Education Specialist are the same as those for the degree of Master of Arts in Education (see page 19).

THE COMPREHENSIVE EXAMINATION

Successful completion of a six-hour written examination and/or an oral examination, at the option of the major field advisor, is required.

School of Government and Business Administration

The School of Government and Business Administration has academic jurisdiction over the degrees of Master of Science in Administration, Master of Business Administration and Master of Public Administration.

The principal objective of the School of Government and Business Administration is to prepare its graduates for positions in the management of complex organizations in both business and government. The degree programs are designed to prepare students both for *entrance* into business and government and for *advancement* to high-level management positions.

Programs in the School include examination of administrative principles and quantitative approaches to decision-making common to both business and government. These programs stress the points at which major policy decisions of either business or government must give consideration to related policy decisions of the other. Emphasis is placed on the fact that management education is not limited to organizational techniques but is, in the broadest sense, education for management responsibility.

MASTER OF SCIENCE IN ADMINISTRATION

The program leading to the degree of Master of Science in Administration is being discontinued. No admissions will be made after those for the Fall Semester, 1979. Students admitted to this program have the option of continuing in the program, or of transferring to another degree within the School.

MASTER OF BUSINESS ADMINISTRATION OR MASTER OF PUBLIC ADMINISTRATION

Selected courses within these degree programs are available at several off-campus locations. Consult the *Undergraduate and Graduate Bulletin* for admissions information and program requirements.

OFF-CAMPUS LOCATIONS OF THE COLLEGE OF GENERAL STUDIES

DISTRICT OF COLUMBIA

Bolling Air Force Base, Washington, D.C. 20332

Education Director: Edward Corbin
Office: Building 500
Telephone: 767-5348
Representative for the University: Hal Serven
Telephone: 676-7028
Open to military and civilian personnel

Federal After-hours Program

Representative for the University: Robert W. Stewart, Jr.
Telephone: 676-7018
Open to everyone

The following agencies participate in the Federal After-hours Program:

BUREAU OF CUSTOMS, WASHINGTON, D.C. 20229

James J. Doherty, Chief, Training and Career Development Branch
Office: U.S. Customs Service Academy, 3600 M Street, N.W.
Telephone: 634-5060

INDUSTRY AND TRADE ADMINISTRATION,
WASHINGTON, D.C. 20230

Education Director: T. Bruce Robinson, Jr., Director, Employee Development Division
Office: Room 3525, Main Commerce Building, 14th Street and Constitution Avenue, N.W.
Telephone: 967-5075

DRUG ENFORCEMENT ADMINISTRATION,
WASHINGTON, D.C. 20573

Education Director: Oscar Simon, In-Service Programs
Office: Room 805, 1405 Eye Street, N.W.
Telephone: 633-1354

CIVIL SERVICE COMMISSION, WASHINGTON, D.C. 20415

For information contact Employee Development Officer, Personnel and Labor Relations Division

Office: Room 3H15, 1900 E Street, N.W.
Telephone: 632-5430

COAST GUARD, WASHINGTON, D.C. 20591

W.I. Barry, Chief, Training Section, Headquarters Civilian Personnel Branch (CAS-5/81)
Office: Room 8112B, Nassif Building, 400 7th Street, S.W.
Telephone: 426-2342

DEPARTMENT OF JUSTICE, WASHINGTON, D.C. 20530

Education Director: Ellis Berne
Office: 521 12th St., N.W.
Telephone: 724-7492

DEPARTMENT OF LABOR, WASHINGTON, D.C. 20210

Office: Room C5510, 200 Constitution Avenue, N.W
Telephone: 523-6662

DEPARTMENT OF THE TREASURY, WASHINGTON, D.C. 20226

BUREAU OF GOVERNMENT FINANCIAL OPERATIONS

Training Officer: Ruth White, Manager, Employee Development Branch
Office: Room 544, Treasury Annex Number 1, Pennsylvania Avenue and Madison Place, N.W.
Telephone: 566-8775

GOVERNMENT OF THE DISTRICT OF COLUMBIA, WASHINGTON, D.C. 20001

Education Director: Edward E. Anderson, Acting Assistant Director, Employee Development and Services
Office: Room 207, 499 Pennsylvania Avenue, N.W.
Telephone: 629-2997

FEDERAL AVIATION ADMINISTRATION, WASHINGTON, D.C. 20591

Education Director: Rita Blake, Employee Development Specialist
Office: Room 515, 800 Independence Avenue, S.W.
Telephone: 426-3320

FEDERAL RESERVE BOARD, WASHINGTON, D.C. 20551

Education Coordinator: Michael Bishoff, Resource Development Specialist
Office: 20th Street and Constitution Avenue, N.W.
Telephone: 452-3385

GENERAL SERVICES ADMINISTRATION, WASHINGTON, D.C. 20405

Training Officer: Joel B. Gerstle, Director, Training and Development Division (BPT)
Office: Room 6215, 18th and F Streets, N.W.
Telephone: 566-1278

INTERNAL REVENUE SERVICE, WASHINGTON, D.C. 20224

David C. Barry, Chief, National Office Training Branch
Office: Room 1013, 1111 Constitution Avenue, N.W.
Telephone: 566-6101

INTERSTATE COMMERCE COMMISSION, WASHINGTON, D.C. 20423

Samuel D. Bingman, Jr., Director of Training
Office: Training Branch, Room 6363, 1200 Constitution Avenue, N.W.
Telephone: 275-7876

NATIONAL SCIENCE FOUNDATION, WASHINGTON, D.C. 20550

Career Development and Training Officer: Sandra Menke
Office: 1800 G Street, N.W.
Telephone: 632-4106

VETERANS ADMINISTRATION, WASHINGTON, D.C. 20420

Education Director: Raymond L. Butler, Chief, Employee Relations and Training Division
Office: Room 100, Veterans Administration Main Building
Vermont Avenue and H Street, N.W.
Telephone: 389-3101

Federal Communications Commission, Washington, D.C. 20554

Education Director: Thomas Tate
Office: Room A-108, 1229 20th Street, N.W.
Telephone: 632-6304 or 632-6385
Representative for the University: LeRoy S. Paul
Telephone: 676-7062

Forrestal Building, L'Enfant Plaza, Washington, D.C. 20314

Education Director and Chairman of the Armed Forces Education and Training Advisory Council: Philip F. Strauss
Office: Room 3C147, Pentagon
Telephone: 694-4514
Program Coordinator: Fred McKinney
Office: Room GE222, Forrestal Building
Telephone: 693-8484 or 693-8485
Representative for the University: Hal Serven
Telephone: 676-7028
Open to active duty military personnel, Department of Defense civilians, retired military personnel and other federal employees

Industrial College of the Armed Forces, Fort McNair, Washington, D.C. 20319

Coordinator: Bernard S. Waterman
Office: Room D–281, Industrial College of the Armed Forces
Telephone: 693-8507
Director for the University: Harry R. Page
Office: Room 308, Hall of Government, 710 21st Street, N.W.
Telephone: 676-7250
Representative for the University: LeRoy S. Paul
Telephone: 676-7062
Open to students and faculty of the Industrial College of the Armed Forces

Library of Congress, Washington, D.C.

Capitol Hill Graduate and Undergraduate Programs
Representative for the University: Nancy Berns
Telephone: 676-7067

Naval Research Laboratory, Washington, D.C. 20032

Education Specialist: Sylvia Wahler
Office: Navy Research Laboratory, Bldg 72
Telephone: 767-2956
Representative for the University: Hal Serven
Telephone: 676-7028

Naval Security Station, 3801 Nebraska Avenue, N.W., Washington, D.C. 20390

Education Services Officer: Danny Snare
Telephone: 282-0860
Representative for the University: LeRoy S. Paul
Telephone: 676-7062

Naval Telecommunications Command, 4401 Massachusetts Avenue, N.W., Washington, D.C. 20370

Education Director: Allen Price
Telephone: 282-0371
Representative for the University: LeRoy S. Paul
Telephone: 676-7062

United States Army Institute of Dental Research Walter Reed Army Medical Center, Washington, D.C. 20012

Lt. Colonel David Brunner, Chief, Professional Development
Office: Building 40
Telephone: 576-3443
Representative for the University: Edward B. Wright
Telephone: 676-7024
Open to military personnel assigned to duty and graduate study at USAIDR

Washington Navy Yard, Washington, D.C. 20374

Glenn C. Archibald, Head, Education and Training Branch
Office: Building 92, Anacostia Naval Station
Navy Campus for Achievement: James Woods
Office: Building 92, Anacostia Naval Station
Telephone: 433-3182
Employee Development Officer: Doris Moore
Office: Room 202, Building 172, M and 9th Streets, S.E.
Telephone: 433-4954
Representative for the University: Nancy Berns
Telephone: 676-7067
Open to government and nongovernment employees

MARYLAND

Aberdeen Proving Ground, Md. 21005

Aberdeen Area Education Director: John L. Lichi, Chief, Educational Services Division

Office: Building 3146, Army Education Center, Aberdeen Proving Ground, Md. 21005
Telephone: (301)278-3385
Representative for the University: Laurie Berrett
Telephone: (202)676-7398
Open to everyone by permission of the Commanding Officer of Aberdeen Proving Ground

Andrews Air Force Base, Washington, D.C. 20331

Education Services Officer: Lloyd J. Flynn
Office: Building 3484
Telephone: 981-6377
Representative for the University: John Williams
Telephone: (202)676-7029
Open to military and civilian personnel of the Air Force and to others by permission

Defense Mapping Agency, Topographic Center, Bethesda, Md. 20315

Education Director: Gene Hastings, Chief, Training and Development Division
Office: Erskine Hall, 6500 Brooks Lane
Telephone: 227-2147
Representative for the University: Laurie Berrett
Telephone: (202)676-7398
Open to employees of the Defense Mapping Agency, Topographic Center, and others by permission, obtained at least one week prior to the first week of classes, from the Training and Development Division, Telephone 227-2147

Edgewood Arsenal, Md. 21010

Education Officer: Robert P. Mehr
Office: Building 4475, Edgewood Arsenal, Md. 21010
Telephone: (301)671-2166
Representative for the University: John Williams
Telephone: (202)676-7029
Open to everyone by permission of the Commanding Officer of Edgewood Arsenal

Fort George G. Meade, Md. 20755

Education Director: Bruce Blevins
Office: Building B393, Army Education Center
Telephone: (301)677-6421
Representative for the University: John Williams
Telephone: (202)676-7029
Open to everyone by permission of the Commanding Officer of Fort George G. Meade

Goddard Space Flight Center, Greenbelt, Md. 20771

Bruce Sieling, Employee Development
Telephone: 982-4966
Representative for the University: Edward B. Wright
Telephone: (202)676-7024

Montgomery County Public Service Training Academy, Rockville, Md. 20850

Education Director: Karen J. Plucinski, Coordinator, Police Professional Advancement Program

Office: Public Service Training Academy, 10025 Darnestown Road
Telephone: 279-8250
Representative for the University: Robert Engle
Telephone: (202)676-7025
Open to Montgomery County employees and to others by permission

National Naval Medical Center, Bethesda, Md. 20014

Education Director: Nick Szabados, Head, Training and Educational Services
Office: Building 123
Telephone: 295-1751
Representative for the University: Laurie Berrett
Telephone: (202)676-7398
Open to military and civilian personnel of the Navy, employees of the National Institutes of Health, and to others as space permits

National Oceanic and Atmospheric Administration, Rockville, Md. 20852

Education Officer: Daniel E. Bella
Office: Room 316, North Bethesda Office Center II, 5640 Nicholson Lane, Rockville, Md. 20852
Telephone: 496-8481
Representative for the University: Laurie Berrett
Telephone: (202)676-7398
Open to all employees of the Department of Commerce and to others by permission

Naval Academy, Annapolis, Md. 21402

Coordinator for the University Programs: William W. Jeffries, Archivist, U.S. Naval Academy
Office: Nimitz Library
Telephone: (301)267-2178
Representative for the University: Edward B. Wright
Telephone: (202)676-7024
Open to military personnel, civilian government employees and to others by permission

Naval Air Station, Patuxent River, Md. 20670

Ted White, Head, Employee Development; Wanda Denton, Employee Development Specialist
Office: Naval Building 463, Civilian Personnel Department
Telephone: (301)863-3734 or 863-3735
Representative for the University: Edward B. Wright
Telephone: (202)676-7024
Open to military and civilian personnel of the Navy and to others by permission

Naval Graduate Dental School, Bethesda, Md. 20014

Commanding Officer: Captain Stewart R. Elder, USN
Education Director: Captain Richard G. Shaffer, USN
Office: Building 122
Telephone: 295-0064
Representative for the University: Edward B. Wright
Telephone: (202)676-7024
Open to military personnel assigned to duty and graduate study at the Naval Graduate Dental School

Naval Ordnance Station, Indian Head, Md. 20640

Edward Drinks, Head, Training Division
Telephone: (301)743-4506
Representative for the University: Edward B. Wright
Telephone: (202)676-7024
Open to everyone by permission of the officer in charge of the station

Naval School of Health Care Administration, Bethesda, Md. 20014

Commanding Officer: CDR William Auton, MSC, USN
Executive Officer: CDR Patrick Collier, MSC, USN
Office: Room 131, Building 141
Telephone: 295-1314
Representative for the University: Edward B. Wright
Telephone: (202)676-7024
Open to military personnel assigned to duty under instruction at the U.S. Naval School of Health Care Administration

Naval Ship Research and Development Center, Annapolis, Md. 21402

Jacqueline Nye, Head, Training Division
Telephone: (301)227-1204 or -1169
Representative for the University: Edward B. Wright
Telephone: (202)676-7024
Open to military personnel, civilian government employees and to others by permission

David W. Taylor Naval Ship Research and Development Center, Carderock, Md. 20007

Jacqueline Nye, Head, Training Division
Office: Room 113A, Building 8
Telephone: 227-1204 or -1169
Representative for the University: Laurie Berrett
Telephone: (202)676-7398
Open to military personnel and civilian employees of the Naval Ship Research and Development Center and to others by permission

Naval Ships Engineering Command (see Prince Georges Center Building)

Parklawn Building, Rockville, Md. 20852

Education Director: Larry Livingston
Office: Room 3A25, 5600 Fishers Lane
Telephone: 443-7690
Representative for the University: Robert Engle
Telephone: (202)676-7025
Open to employees of the Department of Health, Education, and Welfare and to others by permission

Prince Georges Center Building, Hyattsville, Md. 20788

Office: Civilian Personnel Office (Training), 3700 East-West Highway
Representative for the University: Robert Engle
Telephone: (202)676-7025
Open to everyone

Social Security Administration, Baltimore, Md. 21235

Director, Center for Continuing Education: Eric Levi
Office: Room 4-L-11, Annex Building, Division of Training and Career Development, 6401 Security Boulevard
Telephone: (301)594-4529
Representative for the University: John Williams
Telephone: (202)676-7029
Open to employees of the Social Security Administration and to others by permission

Suitland Federal Complex, DMA-Hydrographic Center, Suitland, Md. 20390

Eugene Hastings, Head, Training Branch
Office: Main Building, Room 140
Telephone: 227-2147
Representative for the University: Laurie Berrett
Telephone: (202)676-7398

Westinghouse Defense and Electronic Systems Center, Baltimore, Md. 21203

Manager, Education and Technology Training: Stanley F. Block
Office: Baltimore-Washington International Airport, Box 1693
Telephone: (301)765-4447
Representative for the University: Edward B. Wright
Telephone: (202)676-7024
Open to Westinghouse employees and to others by permission

VIRGINIA

Ballston Towers #2, 801 N. Randolph St., Arlington, Va. 22203

Navy Campus Education Office: Betty Kirkpatrick
Crystal Plaza #6, Room 582
Telephone: 692-0198
Representative for the University: Herbert K. Berthold
Telephone: 676-7014
Classes are open to military and civilian personnel of the Department of Defense and others on a space-available basis.

Crystal City, Jefferson Davis Highway, Arlington, Va. 22203

Buildings: Jefferson Plaza; Crystal Square; Crystal Mall; Crystal Plaza; National Center)
Navy Campus Education Office: Betty Kirkpatrick
Crystal Plaza #6, Room 582
Telephone: 692-0198
Representative for the University: Herbert K. Berthold
Telephone: 676-7014
Open to military and civilian personnel of the Department of Defense and others on space-available basis.

Fairfax High School, 3500 Old Lee Highway, Fairfax, Va. 22030

Asst. Principal: Patrick L. Laing
Telephone: 591-3525, -8350; Ext. 69
Representative for the University: Jean Chen
Telephone: 676-7026

U.S. Army Engineer Center and Fort Belvoir, Va. 22060

Education Director: Allen C. Reed

Office: Building T-1483
Telephone: 664-6980
Representative for the University: Sandra Garcia
Telephone: 676-7063
Open to military and civilian personnel of the Army and to others by permission

Hoffman Building, 2461 Eisenhower Avenue, Alexandria, Va. 22314

Education Director: Earl Sullivan
Office: Room 724, Hoffman I
Telephone: 325-0094
Representative for the University: William C. Robinson
Telephone: 676-7064
Open to active duty and retired military personnel and all federal employees

Robert E. Lee High School, Franconia Road, Springfield, Va. 22150

Representative for the University: Sandra Garcia
Telephone: 676-7063
Open to all qualified students

Lynchburg Virginia Center, First and Merchants Bank Building, Room 606, Lynchburg, Virginia 24504

Resident Coordinator: K. Dallas Wade
Telephone: (804)845-6035
Representative for the University: Alvin C. Jensen
Telephone: 676-7020

Marine Corps Development and Education Command, Quantico, Va. 22134

Education Officer: Michael Rowse
Telephone: (703)640-2828
Representative for the University: Sandra Garcia
Telephone: 676-7063

Nassif Building, 5611 Columbia Pike, Falls Church, Va. 22041

MILITARY TRAFFIC MANAGEMENT AND TERMINAL SERVICE

Program Coordinator: Tony Lutz
Office: Room 734, Nassif Building
Telephone: 756-1088
Representative for the University: William C. Robinson
Telephone: 676-7064
Open to active duty and retired military personnel and all federal employees

The Pentagon, Washington, D.C. 20310

Director of the Pentagon Education Center, Chairman of the Armed Forces Education and Training Advisory Council, and Education Officer for the U.S. Army
Philip F. Strauss
Office: Room 3C147, Pentagon
Telephone: 694-4514

U.S. AIR FORCE

Education Officer: Edwin Corbin
Office: Room 5E410, Pentagon
Telephone: 697-1863 or 697-7074
Representative for the University: William C. Robinson, Room 3C155, Pentagon
Pentagon Telephone: 694-4514

University Telephone: 676-7064
Open only to active duty and retired military personnel and all federal employees

U.S. Geological Survey National Center, Topographic Division, 12201 Sunrise Valley Drive, Reston, Va. 22092

Education Officer: Ellen Antholis, Employee Benefits Officer
Telephone: 860-6221
Representative for the University: Laurie Berrett
Telephone: 676-7398

Westgate/Westpark Education Center, Rt. 123, Tyson's Corner, McLean, Va. 22101

Personnel Services Administrator: Martha McGee
Office: Personnel Office, MITRE Corporation
Telephone: 827-6671
Representative for the University: Jean Chen
Telephone: 676-7026

West Springfield High School, 6100 Rolling Road, Springfield, Va. 22150

Representative for the University: Sandra Garcia
Telephone: 676-7063
Open to all qualified students

OFF-CAMPUS LOCATIONS OF EDUCATION COURSES FOR TEACHERS

District of Columbia Public Schools

James T. Guines, Associate Superintendent of Instructional Services
Office: Room 903, Presidential Building, 415 12th Street, N.W.
Telephone: 724-4175
Representative for the University: Norma L. Calhoun
Telephone: 676-7023

Charles Tri-County Center, Waldorf, Md. 20601

Maurice Dunkle, Program Counselor
Office: Thomas Stone High School
Telephone: (301)843-6461
Representative for the University: Kathleen B. McElroy
Telephone: (202)676-7249

CALVERT COUNTY PUBLIC SCHOOLS, PRINCE FREDERICK, MD. 20678

David L. Brown, Director of Personnel Services
Office: Calvert County School Board, Dares Beach Road
Telephone: (301)535-1700

CHARLES COUNTY PUBLIC SCHOOLS, LA PLATA, MD. 20646

Elwood M. Leviner, Director of Personnel Services
Office: Charles County Board of Education, Health and Education Building
Telephone: (301)934-4671

ST. MARY'S COUNTY PUBLIC SCHOOLS, LEONARDTOWN, MD. 20650

Kenneth D. Rigby, Supervisor in Personnel
Office: St. Mary's County School Board of Health Building
Telephone: (301)475-8971

Prince Georges County Public Schools, Upper Marlboro, Md. 20870

Maurice Erly, Coordinating Supervisor of Staff Development and In-Service Train
Office: Prince Georges County School Board
Telephone: 627-4800, Extension 218
Representative for the University: Kathleen B. McElroy
Telephone: 676-7249

TIDEWATER CENTER

George Washington University Tidewater Center: James Noel, Assistant Dean
Office: 2019 Cunningham Drive, Hampton, Va. 23666
Telephone: (804) 838-8444
Open to any qualified individual
Serves the cities in the Tidewater area of Virginia and the following governme
installations:

Camp Elmore, Norfolk, Va. 23511

Education Officer: Major R. Harry, USMC
Telephone: (804)444-6440

Fort Eustis, Va. 23604

Education Director: Michael A. Yannitello
Telephone: (804)878-5508

Fort Lee, Va. 23801

General Education Director: William Brantley
Telephone: (804)734-2605

Fort Monroe, Va. 23351

Education Director: Charles D. Fritts
Telephone: (804)727-2454

Fort Story, Virginia Beach, Va. 23459

Education Director: E.F. Bolick
Telephone: (804)422-7151

Guided Missile School/Fleet Anti-Air Warfare Training Center, Dam Neck, Virginia Beach, Va. 23461

Educational Advisor: William Eberling
Telephone: (804)425-4473

Educational Director (Base): E. R. Case
Telephone: (804)425-4555

Langley Air Force Base, Va. 23365

Education Services Officer: Robert J. Dewey
Telephone: (804)764-2962

NASA-Langley Research Center, Langley Field, Hampton, Va. 23365

Head, Training and Education Services Branch: Malcolm P. Clark
Telephone: (804)827-2611

Naval Air Station, Norfolk, Va. 23511

OIC, PSA: Roy Day
Telephone: (804)444-3291

Naval Air Station, Oceana, Virginia Beach, Va. 23460

Educational Services Officer: S. R. Lacy
Telephone: (804)425-2182
NCFA: John Quane
Telephone: (804)425-3129

Naval Amphibious Base, Little Creek, Norfolk, Va. 23521

Educational Services Officer: PNCF Eugene B. Dickneite
Telephone: (804)464-7811

Naval Supply Center, Norfolk, Va. 23512

Training Director: W. H. Schenk
Telephone: (804)444-4912

Naval Weapons Station, Yorktown, Va. 23491

Director of Training: William A. Jackson
Telephone: (804)887-4831

U.S. Atlantic Fleet, U.S. Naval Base, Norfolk, Va. 23511

Educational Services Officer: Lt. J. O'Briant
Telephone: (804)444-6945

U.S. Coast Guard, Res. Training Center, Yorktown, Va. 23491

Off-Duty Education Officer: Lt. William D. Kline
Telephone: (804)898-3500, Ext. 336

U.S. Naval Regional Medical Center, Portsmouth, Va. 23708

Training Officer: Eugene Rogers
Telephone: (804)397-6541, Ext. 561

U.S. Naval Station, Norfolk, Va. 23511

NCFA: W. Holmgren
Telephone: (804)444-7020



COURSES OF INSTRUCTION

THE FOLLOWING PAGES CONTAIN LISTINGS AND DESCRIPTIONS of courses offered by the departments of instruction and special interdepartmental programs. Courses carrying the designation "Campus Course" are normally offered only on campus. The courses as here listed are subject to change. The University reserves the right to withdraw any course announced or to change the course fees shown herein.

EXPLANATION OF COURSE NUMBERS

COLLEGES AND SCHOOLS OTHER THAN ENGINEERING AND APPLIED SCIENCE

First-group courses—Courses numbered from 1 to 100 are planned for students in the freshman and sophomore years. With the approval of the advisor and the dean, they may also be taken by juniors and seniors. In certain instances, they may be taken by graduate students to make up undergraduate deficiencies or as prerequisites to advanced courses, but they may not be taken for graduate credit.

Second-group courses—Courses numbered from 101 to 200 are planned for students in the junior and senior years. Except for accounting courses, they may be taken for graduate credit only upon the approval of the dean and the instructor at the time of registration. Such approval is granted only with the provision that students must complete additional work to receive graduate credit.

Third-group courses—Courses numbered above 200 are planned primarily for graduate students. They are open, with the approval of the instructor, to qualified seniors; they are not open to other undergraduates.

SCHOOL OF ENGINEERING AND APPLIED SCIENCE

Courses numbered from 1 through 199 are planned for undergraduate credit, although certain courses may be taken for graduate credit when arrangements are approved in advance by the instructor and the dean. Courses numbered 201 to 300 are planned for graduate credit and may in certain instances be taken by qualified undergraduate students. Courses numbered from 301 to 400 are primarily for doctoral students.

SEMESTER HOURS OF CREDIT

The number of semester hours of credit given for the satisfactory completion of a course is, in most cases, indicated in parentheses after the title of the course. Thus, a year course giving three semester hours of credit each semester is marked (3–3), and a semester course giving three semester hours of credit is marked (3). A semester hour may be defined as one 50-minute period of class work or one laboratory period a week for one semester.

ABBREVIATIONS

The following abbreviations are used by the University for course designations:

Acct	Accounting
AmCv	American Civilization
Anat	Anatomy
Anes	Anesthesiology
Anth	Anthropology
ApSc	Applied Science
Art	Art
ArTh	Art Therapy
Bioc	Biochemistry
BiSc	Biological Sciences
BAd	Business Administration
Cart	Cartography
Chem	Chemistry
CH&D	Child Health and Development
Chin	Chinese
CE	Civil Engineering
Clas	Classics
ClEn	Clinical Engineering
CSci	Computer Science
Derm	Dermatology
Econ	Economics
Educ	Education
EPol	Education Policy
EE	Electrical Engineering
EAd	Engineering Administration
EngS	Engineering Science
Engl	English
EFL	English as a Foreign Language
EnHe	Environmental Health
Envr	Environmental Studies
Hum	Experimental Humanities
ForS	Forensic Sciences
Fren	French
Gnet	Genetics
Geod	Geodesy
Geog	Geography and Regional Science
Geol	Geology
Geop	Geophysics
Ger	Germanic Languages and Literatures
Gern	Gerontology
HCA	Health Care Administration
HCS	Health Care Sciences
Hist	History
HKLS	Human Kinetics and Leisure Studies
Idis	Interdisciplinary Courses
IAF	International Affairs
Ital	Italian
Japn	Japanese
Jour	Journalism
Law	Law
Mgt	Management Science
Math	Mathematics
ME	Mechanical Engineering
M&PA	Medical and Public Affairs
Med	Medicine
Micr	Microbiology
MStd	Museum Studies
Mus	Music
NSur	Neurological Surgery
Neur	Neurology
Ob&G	Obstetrics and Gynecology
Ocen	Oceanography
OR	Operations Research
Opth	Ophthalmology
Oral	Oral Biology
Orth	Orthopaedic Surgery
Otol	Otolaryngology
Path	Pathology
Phar	Pharmacology
Phil	Philosophy
Phys	Physics
Phyl	Physiology
PSc	Political Science
Port	Portuguese
Pchi	Psychiatry and Behavioral Sciences
Psyc	Psychology
PAd	Public Administration
Rad	Radiology
Rel	Religion
SLP	Service Learning Program
Slav	Slavic Languages and Literatures
Soc	Sociology
Span	Spanish
SpEd	Special Education
SpDr	Speech and Drama

Stat	Statistics	**U&RP**	Urban and Regional Planning
Surg	Surgery	**Urol**	Urology
TCom	Telecommunication Operations	**WStu**	Women's Studies

Accounting

Chairman: A.J. Mastro, Professor of Accounting; Government 209D, Telephone 676-6825

Accounting courses numbered below the 200 level may not be taken for graduate credit. Accounting courses numbered 201 and above may not be taken for undergraduate credit.

1–2 Introductory Accounting (3–3)

Basic understanding of accounting concepts, procedures, analyses, and reports; the accounting measurement and communications of significant economic and financial data. There is a $25 laboratory fee for Acct 1. Prerequisite: sophomore status. Acct 1 is prerequisite to Acct 2. Students who have received credit for a similar financial accounting course cannot receive credit for Acct 1.

American Civilization*

Director: H.F. Gillette, Jr., Associate Professor of American Civilization, P-101, Telephone 676-6070

71–72 Introduction to American Civilization (3–3) (Campus Course)

Themes and issues in American civilization since Colonial times, with emphasis on their contemporary importance.

†192 The American Cinema (3)

History and criticism of American films. The course will enable the student to recognize and evaluate cinema techniques, to express the evaluation clearly in writing, and to understand the role of films in the context of American culture.

‡197 Oral History and Interview Techniques (3)

Introduction to theory and practice of obtaining and using historical data through recorded interviews. Examination of major published works in oral history. Particular attention to ongoing oral history projects in the Washington area.

271 Seminar: Scope and Methods in American Studies (3)

Consideration of American studies as an area for research and teaching; introduction to bibliography.

* Administered by the American Studies Program
† Joint offering of the American Studies Program and the Speech and Drama Department
‡ Joint offering of the American Studies Program and the History Department

Anthropology

Chairman: Victor Golla, Associate Professor of Anthropology; X-203, Telephone 676-6075

Departmental prerequisite: Anth 1 is prerequisite to Anth 180 through 189. This prerequisite may be waived by permission of instructor.

1–2 **Introductory Anthropology** (3–3)

Anth 1: survey of human origins, physical evolution, and culture history. Anth 2: survey of the world's cultures, illustrating the principles of cultural behavior.

*155 **Anthropological Approaches to Religion** (3)
(Formerly Primitive Religion)

Concepts of the supernatural in nonliterate societies. Religious beliefs and practices. Emphasis on religious process and change.

157 **Primitive Social Organization** (3)

Analysis of the social organization of primitive peoples; kinship, economic, and political systems.

165 **Introduction to Folklore** (3)

History of folklore studies in Europe and America; terminology and study of different folk genres. Same as AmCv 165.

171 **Native Peoples of North America** (3)

Comparative study of Indian groups representative of each of the continent's culture areas.

185 **Latin American Archeology** (3)

Culture history of pre-Columbian Latin America from the Paleo-Indian period through the Spanish Conquest. Focus on Andean South America in even years, on Meso-America in odd years. May be repeated for credit.

Applied Science

Interdepartmental offerings. School of Engineering and Applied Science.

115 **Engineering Analysis III** (3)

Solution of engineering problems using concepts from probability and statistics, including random variables, distribution functions, mathematical expectation, point and confidence interval estimation, hypothesis testing, correlation, and regression. This methodology applied to problems of structural design, bioengineering, manufacturing processes, product quality, equipment reliability, engineering management, and societal engineering. Prerequisite: Math 32.

211 **Analytical Methods in Engineering I** (3)

Engineering applications of the theory of complex variables including contour integration, conformal mapping, inversion integral, and boundary-value problems. Prerequisite: approval of department.

* Joint offering of the Anthropology and Religion Departments.

212 **Analytical Methods in Engineering II** (3)

Analytical methods appropriate to the formulation of engineering problems including finite dimensional vector spaces, eigenvalue problems, generalized Fourier series, tensor calculus, curvilinear coordinates. Prerequisite: approval of department.

213 **Analytical Methods in Engineering III** (3)

Analytical techniques for solution of boundary initial value problems in engineering involving wave propagation, diffusion processes, and potential distributions. Prerequisite: approval of department.

214 **Analytical Methods in Engineering IV** (3)

Introduction to variational methods in engineering including Ritz and Galerkin approximation methods of boundary-value problems. Aspects of linear integral equations arising from engineering analysis. Prerequisite: approval of department.

215 **Analytical Methods in Engineering V** (3)

Advanced methods in solution of boundary-initial value problems in engineering, including characteristics, wave propagation, and Green's functions. Prerequisite: ApSc 213.

216 **Special Topics in Engineering Analysis** (3)

Selected topics such as (1) perturbation techniques applied to approximate solution of nonlinear boundary and initial value problems in engineering; (2) application of singular integral equations in problems of mechanics; (3) applications of elements of functional analysis in engineering and science. Prerequisite: approval of department.

Art

Chairman: L.F. Robinson, Associate Professor of Art; Building H, Telephone 676-6085

31–32 **Survey of Western Art** (3–3)

A foundation for further study in the history of art. Art 31: prehistoric to Gothic art. Art 32: proto-Renaissance to contemporary art.

71–72 **Introduction to the Arts in America** (3-3)

Art 71: Colonial beginnings to the Republican age. Art 72: 19th century to the present.

109 **19th-Century Art in Europe** (3)

110 **Contemporary Art** (3)

112 **Art of Egypt and the Ancient Orient** (3)

Study of the art of Mesopotamia, Anatolia, Egypt, and Persia.

113 **Baroque Art in Italy** (3)

115 **Christian Iconography** (3)

Origins and development of Christian symbols and themes from early Christian to modern times.

117 **Medieval Art I** (3)

Early Christian and Byzantine.

120 **Art of China and Japan** (3)

129–30 **Principles of Museum Work** (3–3)
Introduction to the history and development of museums; problems of mu-
seum administration, connoisseurship, cataloguing, installation, conserva-
tion, and educational service.

141 **Interior Design** (3)
Principles of decoration dealing with furniture designs and ensemble lay-
out, draperies, color, accessories, and lighting.

145 **Folk Arts in America** (3)
Ceramics, woodcarving, ironwork, decorative painting, weaving, and other
crafts.

155 **Etruscan Art and Archeology** (6)
Art and Archeology Program in Italy.

203 **Primitive Art** (3)

242 **Etruscan Art and Archeology** (6)
Art and Archeology Program in Italy.

Biological Sciences

Chairman: S.O. Schiff, Professor of Zoology; Bell 301A, Telephone 676-6090

BIOLOGY

3–4 **Introductory Biology for Nonscience Majors** (3–3) (Campus Course)
Lecture (2 hours), laboratory (2 hours). Survey of biological principles
emphasis on man as a functional organism in the environment. Prerequisite
to BiSc 4: BiSc 3. Material fee, $18 per semester.

11–12 **Introductory Biology for Science Majors** (4–4) (Campus Course)
Lecture (3 hours), laboratory (3 hours). BiSc 11: Biological concepts
and principles are demonstrated through consideration of the plant as an
organism. BiSc 12: Beginning principles of inheritance, development, be-
havior, physiology, systematics, and evolution, using animals as the sub-
ject of investigations; designed to furnish a base for advanced studies in
biology and related sciences. Prerequisite to BiSc 12: BiSc 11. Material
fee, $24 per semester.

Business Administration

Chairman: S.F. Divita, Professor of Business Administration; Government 302,
Telephone 676-6115

51 **Introduction to Business** (3)
Structure, activities, and problems of business enterprise; its contribution
to the individual and to society; careers in business.

161 Commercial Law (3)

Fundamental concepts and principles of law encountered in business activity: contracts, bailments, agency, sales, negotiable instruments, bankruptcy, other topics. Basic legal considerations in business decesion-making.

Cartography*

Program Advisor: Hyman Orlin, Professorial Lecturer in Cartography, Geodesy, and Oceanography, Building F, Telephone 676-7000 or 946-3557

1 Cartography I (3)

Introduction to the fundamental concepts and practical applications of cartography. Prerequisite: Math 3, 6, or equivalent.

2 Cartography II (3)

Aerial photography, modern topographic and hydrographic mapping and charting, thematic maps, map reliability, planning and design and reproduction. Prerequisite: Cart 1.

102 Elements of Remote Sensing (3)

Basic elements of remote sensing. Emphasis on the electromagnetic spectrum, infrared photographic systems, thermal systems, and analysis of multispectral photography and thermal imagery. General characteristics of satellite remote sensing. Prerequisite: Cart 1 and 2 (or equivalent experience), Geod 17, and Math 31.

104 Photo-interpretation (3)

Interpretation of topographic, vegetative, hydrologic, and man-made features. Civil and military applications. Applications to urban planning and urban-industrial patterns. Use of satellite imagery and remote sensing data. Color aerial photographs and underwater photography. Prerequisite: Cart 102, Geod 17, Math 31; or permission of instructor.

107 Physiography (3)

Development of physiographic concepts; the earth's crust, weathering, climate, and denudation; stream, shore, wind, and ice processes; glaciation; physiographic regions.

108 Climatology (3)

Causes for climate and weather, air mass movements, water mass movements, physical features of boundaries. Tropics, subtropics, humid and dry continentals, subarctics.

111 Cartographic Techniques (3)

Techniques and procedures, field methods, evaluation of source material, use of scribing and contact screens in color separation, shaded relief, and reproduction. Lectures and laboratory. Laboratory fee to be announced. Materials fee, $20. Prerequisite: Cart 2, Geod 12, Math 3, 6 (or equivalent experience).

113 Map Design (3)

Functional requirements of various kinds of maps. Principles of human perception and visual communication. Influence of reproduction proc-

* Affiliated with the Department of Geography and Regional Science

esses on map design. Optimizing results within constraints of availab source material, equipment, time, money, manpower, and reproduc process. Changing tradition of map design. Influence of experime work and progress in the commercial and fine arts on map design. Rol of map design in mapping organizations. Prerequisite: Cart 107 and

115 **Cartometrics I** (3)

Examination of the application of automatic computing systems to ca tography. Course will cover batch processing and time sharing and de icated mini-computer systems as well as digitigers, plotters, and graph terminals. Prerequisite: Cart 1, 2.

116 **Cartometrics II** (3)

Analysis of cartographic computing programs, cartographic data struc tures and automated mapping data bases. Examination of FORTRAN programming methods as they apply to cartography. Preparation o coordinate transformation programs, map projection programs, and plo ting software. Prerequisite: Cart 115; Geod 106; or equivalent experience Laboratory fee for computer use.

120 **Computer Mapping I** (3)

The analysis and application of computer mapping methods consisting o the techniques for the automation of data bases and the creation of com puter generated map output. Students will develop application programs i laboratory sessions. Prerequisite: Cart 115, 116. Laboratory fee for com puter use

121 **Computer Mapping II** (3)

Study of advanced applications of computer mapping methods and applica tions that include 2- and 3- dimensional automated plotter programs. Course will include laboratory sessions and students will develop an ad vanced seminar project. Prerequisite: Cart 120. Laboratory fee for com puter use

125 **Marine Cartography** (3)

Exploring the extended and imaginative symbology required to depict a visually opaque environment characterized by sparsity of data, the dyn matic aspects of oceanographic mapping. Prerequisite: Cart 2.

126 **Topographic Mapping** (3)

The application of control surveys and photogrammetry to topographic mapping. National Map Accuracy Standards. Systematic applicatio geographic names. Field completion. Feature classification and symbol zation. Map compilation and color separation. Comparison of Americ and foreign topographic maps and methodologies. Prerequisite: Cart 1 111; Geod 12, 13

128 **Thematic Mapping** (3)

Analysis of the thematic map as a means of communicating qualitative and quantitative data. The function and design of base maps for the matic overprints. Source material research, analysis and manipulation. Map layout and symbol design. Experimental studies to compare the data the cartographer intends to communicate with the map and that actually extracted by the reader. Prerequisite: Math 31; Cart 111; and Geod 106

131 **Techniques in Remote Sensing** (3)

The application of remote sensing to earth resource studies with em phasis on the physical characteristics of electromagnetic radiation, ma

tispectral sensing, and photographic and digital image analysis. Satellite systems and the cartographic treatment of remote sensing data. Prerequisite: Cart 102; Math 31; and Phys 1 or 3.

135 **Cartographic Photography and Printing** (3)

Historical development of map printing since the introduction of photography. Comparison of printing processes. Contact and camera photography. Light sources for the darkroom and exposure. Photographic emulsions, sensitometry and densitometry. Phototypography. Comparison of color-proofing methods. Registration systems. Plate making, press work. Preparation of specifications for contractual printing. Quality control and other managerial problems. Prerequisite: Cart 111.

140 **Sensitometry of Photomapping** (3)

Construction of tone reproduction curves; optimization of photographic presentation; evaluation of photo materials, equipment and systems. Prerequisite: Math 31, Phys 1, or equivalent experience.

142 **Mechanics and Kinetics of the Photographic Process** (3)

Light, optics and photometry as applied to the photographic process; sensitometry and densitometry for quality control and assurance; density slicing; image enhancement; auto- and self-dodging; antivegnetting masks.

Chemistry

Chairman: R.E. Wood, Professor of Chemistry, Corcoran 105, Telephone 676-6120

PHYSICAL SCIENCE

3–4 **Contemporary Science for Nonscience Majors** (3–3)
(Campus Course)

Lecture (2 hours), laboratory (3 hours). Contemporary topics in physical, biological, and medical science. Chem 3 is not prerequisite to Chem 4 but both courses must be satisfactorily completed to fulfill the meaningful initiation requirement. Laboratory fee, $20 per semester.

5–6 **Contemporary Science** (3–3)

Nonlaboratory course for off-campus students only. Survey covering topics in contemporary science: population control, pollution, drugs, food additives, etc.

CHEMISTRY

11–12 **General Chemistry** (4–4) (Campus Course)

Lecture (3 hours), laboratory (3 hours), recitation (1 hour). Elementary course in general chemistry, including qualitative analysis. Prerequisite to Chem 11: one year of high school algebra. Prerequisite to Chem 12: Chem 11. Laboratory fee, $28 per semester.

201 **Environmental Science and Technology** (3)

Chemistry and physics of environmental pollution; emphasis on water and air pollution. Instrumental techniques and their limitations. Students present papers emphasizing chemical and physical aspects of an environmental pollutant.

Chinese*

Chairman: C. Shih, Professor of Chinese; Library 613, Telephone 676-7106, 7263

1–2 **Beginning Mandarin Chinese, Level I** (3–3) (Campus Course)
Classroom (3 hours), laboratory (1 hour). Fundamentals of grammar and pronunciation with graded reading and practice in writing. Prerequisite to Chin 2: Chin 1. Laboratory fee, $17.50 per semester.

3–4 **Beginning Mandarin Chinese, Level II** (3–3) (Campus Course)
Classroom (3 hours) laboratory (1 hour). Continuation of grammar and spoken Chinese with more emphasis on the written language and reading. Prerequisite to Chin 3: Chin 2 or equivalent. Prerequisite to Chin 4: Chin 3. Laboratory fee, $17.50 per semester.

10 **Chinese Calligraphy** (1) (Campus Course)
Design and writing of Chinese characters with traditional writing implements. No knowledge of the language required. May be repeated for credit.

13–14 **Reading Chinese for Beginners** (4–4) (Campus Course)
Basic grammar and syntax of modern Chinese; development of reading ability in beginners' textbooks and newspapers. Primarily for graduate students who wish to acquire a reading knowledge without learning to speak or write the language.

Civil, Mechanical, and Environmental Engineering

Chairman: Ali Bulent Cambel, *Professor of Engineering and Applied Science*. Tompkins 307, Telephone 676-6749

CIVIL ENGINEERING

168 **Introductory Soil Mechanics** (3)
Engineering properties of soils; analysis of lateral earth pressures, bearing capacity, foundations, and slope stability. Prerequisite: CE 120 *Introduction to the Mechanics of Solids* (3) and ME 126 *Fluid Mechanics* (3)

191 **Metal Structures** (3)
Principles of the design of metal structures; structural elements; connections; specific problems of analysis; methods of construction. Prerequisite: CE 122 *Structural Theory II* (3).

192 **Reinforced Concrete Structures** (3)
Principles of the design of reinforced concrete structures. Details of reinforcement of structural elements. Monolithic structures, precast elements, methods of construction. Prerequisite: CE 121 *Structural Theory I* (3).

201 **Design of Metal Structures** (3)
Structural behavior of metal structures, conception and design of advanced structural components and systems, hysteretic behavior, plastic design principles, box type girders, cable systems, composite girders, and special topics. Prerequisite: CE 191 or equivalent.

* Administered by the Department of East Asian Languages and Literatures.

202 **Design of Reinforced Concrete Structures** (3)

Structural behavior of reinforced concrete structures, conception and design of structural components, prestressed concrete, slabs, ultimate strength and deformation, box type girders, hysteretic behavior, safety considerations, and special topics. Prerequisite: CE 192 or equivalent.

203 **Prestressed Concrete Structures** (3)

Structural behavior and failure modes of prestressed concrete structures; design in prestressed concrete, including long span structures, bridges, and precast systems. Prerequisite: CE 192 or equivalent.

206 **Foundation Engineering** (3)

Principles of soil mechanics and structural mechanics applied to the analysis and design of spread footings and mat foundations, pile foundations, retaining structures, including sheeting and bracing systems, and waterfront structures. Problems associated with subsurface exploration, dewatering excavations, and underpinning. Prerequisite: approval of department.

253 **Failure and Reliability Analysis of Engineering Structures** (3)

Operational and structural failure mechanisms; instability, fracture, and fatigue. Operational and structural safety, probability of failure. Aspects of probabilistic structural analysis, statistics of extremes, risk and reliability, optimal design criteria. Prerequisite: ApSc 115 or equivalent.

254 **Special Topics in Structural Engineering** (3)

Selected problems in structural mechanics and design: (1) thermal stresses in structural systems, (2) advanced probabilistic structural mechanics, (3) structural design for dynamic loads, (4) structural design for repeated loads, or (5) advanced structural applications. May be repeated for credit. Prerequisite: CE 210 *Methods of Structural Analysis* (3), and approval of department. Topic to be announced in the *Schedule of Classes*.

255 **Coastal Processes** (3)

Longshore currents and nearshore circulation; coastal sediment properties and analysis, longshore transport processes and rates; sediment budget; response of beaches to wave action and structures; tidal inlets, mechanical bypassing; beach nourishment; wind transport of sandy dune stabilization, sediment tracing. Prerequisite: approval of department.

258 **Harbor and Coastal Engineering II** (3)

Interaction between structures and waves. Analysis and design of flexible structures: piers, jetties, and protective structures; off-shore drilling platforms. Design criteria, moorings and cables, harbor operations equipment. Prerequisite: CE 252 *General Structural Dynamics* (3) or equivalent; CE 257 *Harbor and Coastal Engineering I* (3)

261 **Analysis of Plates and Shells** (3)

Bending and stretching of thin elastic plates under loading with various boundary conditions, continuous plates and plates on elastic foundations, theory of folded plate structures. Theory of curved surfaces; general linear bending theory and its simplification to membrane theory; bending stresses in shells of revolution, shallow shell theory. Specific applications. Prerequisite: graduate status.

263 Theory of Structural Stability (3)

General criteria for stability; buckling of elastic and inelastic columns and frames; torsional and lateral buckling; variational methods. Buckling of plates and shells under static loads; stability of stiffened structures; effect of imperfections and boundary conditions. Prerequisite: graduate status.

271 Theoretical Marine Hydromechanics (3)

Introductory course designed to acquaint the student with some physical concepts and mathematical tools of theoretical marine hydromechanics. Derivation of the fundamental equations and boundary conditions of a fluid media; application of potential-flow theory to fluid motion around two- and three-dimensional bodies; perturbation concepts. Introduction to thin-ship and slender-body theories. Derivation of force and movement of bodies in calm and disturbed water. Prerequisite: approval of department.

274 Mechanics of Water Waves (3)

Irrotational theory for deep- and shallow-water waves, reflexion, refraction, diffraction, attenuation. Water waves of finite amplitude: shallow-water theory, tides, bores, long-waves theory, conoidal and solitary waves. Wave generation by wind, state-of-the-art based on correlation between theory and measurements. Wave-breaking and reflexion. Prerequisite: ME 221 or equivalent and permission of instructor.

275 Special Topics in Ocean Engineering (3)

Selected topics: (1) marine aspects of viscous-flow theory, (2) interfacial (internal) waves, (3) applied random processes in ocean and coastal engineering, or (4) other selected topics. May be repeated for credit. Prerequisite: approval of department.

ENGINEERING SCIENCE

203–4 Probability and Statistics of Metrology (3–3)

Probability distributions, discrete and continuous distributions; sampling; combinatorial analysis; stochastic processes; conditional probability; correlation; analysis of variance; design and analysis of experiments; Latin Square experiments; factorial experiments; block and lattice design. Prerequisite: ApSc 115 or equivalent.

221 Theory of Elasticity I (3)

Introduction to Cartesian tensor analysis; deformation, stress, linear constitutive relations, formulation of boundary value problems, variational principles; torsion and bending of prismatical rods, plane problems in elastostatics. Prerequisite: approval of department.

229 Transformations in Materials (3)

Thermodynamics of solids, statistical interpretation of entropy, lattice defects, equilibrium in multicomponent systems, rate theory, diffusion, phase transformations, nucleation and growth, precipitation, martensitic transformations. Prerequisite: approval of department.

231 Structure of Materials (3)

Space lattices, crystal structures, planes, directions, anisotropy, texture and preferred orientations, stereographic projections, Bragg's law, Laue techniques, moving crystal diffraction, Debye-Scherrer method, x-ray spectrometry, electron microscopy, bonding energy of crystals, lattice energy, lattice vibrations, free electron theory, zone theory, alloy theories, conductors, insulators and semiconductors, magnetism, resistivity, defects in metals. Prerequisite: approval of department.

234 **Composite Materials** (3)

Principles of composites and composite reinforcement: micromechanics and failure; interface reactions in various composites; reinforcing materials; structure of composites—fiber-reinforced polymers, filler-reinforced polymers, fiber-reinforced metals, directionally solidified alloys, dispersion-strengthened metals. Prerequisite: approval of department.

239 **Physical Ceramics** (3)

Crystal chemistry and the systematic study of the structure of ceramic materials; solid reactions occurring at elevated temperatures, sintering vitrification, diffusional mechanisms and effects; reaction rate theory; elastic, anelastic, and plastic properties of ionic and covalent solids; viscoelastic behavior of vitreous and vitreous-solid systems; phase equilibria of ceramic systems. Prerequisite: approval of department.

240 **Fracture Mechanics** (3)

Fundamentals of brittle fracture, Griffith theory and extensions, mechanics of fracture, linear elastic systems, plasticity considerations, fracture toughness, engineering analysis, notch strength analysis with limit approach, crack propagation laws, fatigue, fracture testing, comparison of recent continuum theories. Prerequisite: EngS 221 or CE 261.

263 **Atmospheric Physics for Engineers I** (3)

Atmospheric radiation; phenomenological equation of transfer; solutions to the transfer equation; optical, physical, and chemical properties of atmospheric constituents; remote sensing and the direct inversion problem; energy transfer and atmospheric structure. Prerequisite: approval of department.

264 **Atmospheric Physics for Engineers II** (3)

Atmospheric dynamics; mean structure of the atmosphere, temperature, pressure, and wind fields; mass, momentum, and energy transfer; large-scale features of atmospheric circulation; regional features of atmospheric circulation, micrometeorology. Prerequisite: approval of department.

270 **Theoretical Acoustics I** (3)

Basic acoustic theory in stationary and uniformly moving media; waves in infinite space; sound transmission through interfaces between layered media and between media in relative motion; sound radiation from simple solid boundaries, source and dipole fields; propagation inducts and enclosures; elements of classical absorption of sound. Prerequisite: ME 221 and ApSc 213 or equivalent.

271 **Random Process Theory I** (3)

Random processes; stationarity and ergodicity; mean-square calculus; auto- and cross-correlations and spectra; random processes in linear systems; mean-square estimation, prediction and filtering; zero and level crossings and peak distributions; applications in aerospace sciences. Prerequisite: EngS 203 or approval of department.

272 **Random Process Theory II** (3)

Discrete and continuous state Markov-processes; chains, queues, diffusion, and passage problems; linear and nonlinear estimation and stochastic control; estimation of correlations and power spectra; applications in communication theory; scattering from random surfaces; stochastic linearization and stability. Prerequisite: EngS 271.

273 **Time Series Analysis** (3)

Harmonic analysis of deterministic and random signals; auto- and cross-correlations and spectra; periodogram, Blackman-Tukey and direct filtering methods of spectral estimation; effects of finite length and digitization variability; coherence. Fast Fourier transform techniques; applications in modern technology. Prerequisite: EngS 271 or approval of department.

274 **Environmental Noise Control** (3)

Introduction to the physical effects of noise and vibration on man, practical sources of noise and their control; building noise, ventilation system noise, mechanical equipment noise, aircraft noise; automobile and truck noise; factors affecting vibration levels and vibration control by structural design, damping, and isolation. Prerequisite: EngS 270, ME 215.

275 **Theoretical Acoustics II** (3)

General theory of sound propagation in homogeneous media, viscous and heat conduction effects; methods of solving the inhomogeneous wave equation; theory of sound radiation, sources, dipoles, quadrupoles; radiation from moving sources; scattering and diffraction of sound by obstacles; introduction to acoustics of inhomogeneous media, geometric acoustics. Prerequisite: EngS 270.

276 **Acoustical and Mechanical Measurements** (3)

Characteristics of signals, basic transducer elements, standards of measurements and calibrations, signal recording and processing, acoustical and vibration instrumentation, vibration exciters, vibration testing techniques, flow mechanical measurements. Prerequisite: EngS 270, ME 215.

277 **Physical Acoustics** (3)

Concepts of continuum mechanics and thermodynamics, wave propagation in real media, thermal viscous and relaxational attenuations, piezoelectric crystals and ultrasonics, wave propagation in rigid and deformable porous media. Prerequisite: EngS 275.

278 **Psychological and Physiological Acoustics** (3)

Auditory system and its response to sound, experimental methodology in psychoacoustics, subjective response to sound, environmental noise and its evaluation, criteria for the prediction of noise nuisance, nonauditory system response to noise. Prerequisite: approval of department.

279 **Human Factors in Engineering** (3)

Man-machine interface, effects of physical stress on human behavior and performance, life support system, learning and conditioning of physical stress.

280 **Special Topics in Acoustics** (3)

Current methods and problems in acoustics. Topics chosen from such areas as aerospace noise generation and control; instruments and procedures for acoustics measurements; and responses of structures, people, and communities to noise. Prerequisite: approval of department.

284 **Numerical Methods in Engineering** (3)

Uses of computers in engineering and science; numerical interpolation, integration and differentiation; least squares approximations and application to data fitting; roots of polynomials; eigenvalue and eigenvector problems, solution of systems of linear equations, ordinary differential equations; introduction to solution of partial differential equa-

tions; applications to initial and two-point boundary value problems in engineering mechanics and other areas of engineering. Prerequisite: approval of department.

285 **Finite Element Methods in Engineering Mechanics** (3)

Formulation of the finite element method through variational principles for structural and continuum mechanics problems. Plane stress, plane strain, three-dimensional elasticity, plate bending, thermal conduction, and potential flow. Techniques of constructing and assembling characteristic elemental matrices, computer implementation of the finite element method. Prerequisite: approval of department.

286 **Analysis and Design of Thin-walled Structures** (3)

Statics of thin-walled beams and panels, force interplay between stiffeners and skin in the analysis and design of stiffened thin-walled structures; strength and stiffness of locally buckled stiffened structures; classification of loads and safety factors; different considerations governing the design of thin-walled structures; critical evaluation of various structural design procedures. Prerequisite: approval of department.

287 **Automated Design of Complex Structures** (3)

Review of techniques for automated design including mathematical programming, fully stressed design, and optimality criteria; application of automated design techniques to stiffened and composite shell-type structures; multiple-load conditions and design constraints. Prerequisite: approval of department.

289 **Special Topics in Theoretical and Applied Mechanics** (3)

Prerequisite: approval of department.

298 **Research** (arr.)

Basic research projects as arranged. May be repeated for credit.

299–300 **Thesis Research** (3–3)

310 **Aeroacoustics** (3)

General theory of aerodynamic sound generation and propagation, Lighthill's formulation of jet noise, similarity laws, supersonic and subsonic jet noise, boundary layer noise, fan and compressor noise, helicopter noise, sonic booms. Current problems in aeroacoustics. Prerequisite: EngS 275.

311 **Nonlinear Acoustics** (3)

Finite amplitude waves and waves in moving stratified media. Interaction between linear and nonlinear waves, wave propagation through nonlinear media, applications to transmission of sound through ducts with flow and absorbing walls. Prerequisite: approval of department.

312 **Theory of Random Vibration** (3)

Response of linear systems to stationary random inputs. Failures resulting from dynamic response. Response of space vehicle structures to intense noise fields, measurement, and application. Prerequisite: EngS 271, ME 215.

313 **Structural Acoustic Interaction** (3)

Coupled response of structures to sound, system of infinite extent, system of finite extent, sound radiation from structure, sound transmission through structure. Panel response to turbulent boundary-layer excitation. Sound radiation from mechanically excited structure vibration. Prerequisite: EngS 270, 312.

398 **Advanced Reading and Research** (arr.)

Limited to students preparing for the Doctor of Science qualifying examination. May be repeated for credit.

399 **Dissertation Research** (arr.)

Limited to Doctor of Science candidates. May be repeated for credit.

MECHANICAL ENGINEERING

215 **Theory of Vibrations** (3)

Damped and undamped natural vibrations, transient response and response to harmonic and periodic excitation, natural vibration of discrete and continuous systems; integral formulation of eigenvalue problems, response by modal analysis, approximate methods, influence of secondary effects and constraints, damped systems. Prerequisite: approval of department.

216 **Structural Dynamics** (3)

Methods of solving vibration problems: differential equation, Rayleigh-Ritz finite element. Free and forced vibration of structural components: straight, curved, and thin-walled beams; plates and shells; sandwich construction. Vibration of built-up structures. Structural wave motion, wave motion in periodic structures. Prerequisite: ME 215.

221 **Intermediate Fluid Mechanics** (3)

The continuum, kinematics of fluids; stress tensor, strain and rate-of-strain tensor; fundamental equations of the flow of viscous compressible fluids; Laplace's equations; source, sink, and doublet; vortices, Biot-Savart theorem and the flow field of a vortex; spherical and cylindrical harmonics; methods of singularity distributions, complex-variable methods; laminar flow of viscous incompressible fluids; boundary-layer concept. Prerequisite: approval of department.

222 **Applied Fluid Dynamics** (3)

Subsonic lifting line wing theory, direct and inverse solution of the lifting surface theory; singularity method for wing-body combination; vortex lift theory; effects of camber and twist distribution; transonic airfoils, effects of wing sweep, area ruling concept; supersonic linearized wing theory, similarity rules. Prerequisite: ME 221 or equivalent.

227 **Viscous Flow** (3)

Exact solution of Navier-Stokes equations; the small Reynolds number approximations, laminar boundary-layer theory and the techniques for its solution, stability of laminar flows; Reynolds theory of turbulent stresses, applications to internal and external flows, turbulent boundary-layer theory; applications to heat transfer problems; flow separation. Prerequisite: ApSc 213; ME 221 or equivalent.

235 **Compressible Flow** (3)

Thermodynamics and physical properties of gases, fundamental equations of a compressible inviscid fluid, small perturbation theory, expansions in Mach number and thickness parameters, second-order shock shapes, role of entropy in supersonic flow, shock wave interactions, holograph transformation, Kármán Tsien and other model gases, conical flows, transonic flow theory, method of characteristics, rotational nonisentropic flows. Prerequisite: ApSc 213; and ME 221 or equivalent.

237 **Energetics of Fluid Flow I** (3)

Energy transformations in fluid flows. Gas dynamics of combustion. Non-

uniform flow, mixing. Mechanisms of flow induction. Applications to pumping, propulsion in water, air, and space, and thrust augmentation. Prerequisite: ME 155 or equivalent.

238 **Energetics of Fluid Flow II** (3)

Wave processes and their utilization. Static, dynamic, and cryptosteady pressure exchange; energy equalizers and dividers. Advanced concepts of air and marine propulsion. Discussion of various concepts of flow induction, thrust generation, and environmental control. Prerequisites: ME 237 or equivalent.

248 **Seminar: Aircraft Design I** (3)

Designing an aircraft to specifications. Regulatory requirements, state-of-the-art limitations, computer-aided design, integration of aircraft components, economic considerations, and iterations to final configuration to obtain specified mission profile. Prerequisite: approval of department.

270 **Aerodynamics of Flight Vehicles** (3)

Aerodynamic loads on flight vehicles, interference effects, application of aerodynamic theory to aircraft design, studies of aircraft dynamics and performance. Prerequisite: ME 222 or equivalent.

271 **VTOL Aircraft Technology** (3)

Fundamental principles of VTOL aircraft; hovering performance based on momentum theory; analysis of jet-induced interference effects; transition aerodynamics; theoretical stability and control and correlation with flight data; ground-effect theory and experiment; handling qualities criteria; elements of instrument approach and landing problem. Prerequisite: approval of department.

273 **Principles of Automatic Flight Control** (3)

Design of aeronautical instrumentation and feedback controls; mathematical models of sensors, controllers, and actuators; theory of feedback control, stability, accuracy, and speed of response; equalization effects of nonlinearities and noise. Prerequisite: approval of department.

274 **Principles of Flight Guidance** (3)

Guidance requirements for atmospheric flight; implementation of guidance systems using inertial and radio techniques in conjunction with automatic data processing. Prerequisite: ME 273.

275 **Stability and Control of Vehicles** (3)

Derivation of equations of motion, Euler transformations and direction cosines, stability derivatives and linearization of equations of motion, stability of linear systems with application to longitudinal and lateral dynamics, Laplace transform techniques and frequency response analysis. Prerequisite: approval of department.

276 **Mechanics of Space Flight** (3)

First- and second-order Hamilton-Jacobi perturbation theory applied to artificial satellites, von Zeipel's methods, special and general perturbation theories for third-body perturbations. Differential correction of orbits by weighted least squares and minimum variance techniques. Comparison of various filtering techniques as applied to orbit determination and other space flight parameter estimation. Prerequisite: approval of department.

279 **Special Topics in Flight Sciences** (3)

Current problems and methods in high angle of attack stability and control. Nonlinear aerodynamics in the angle of attack region above the stall.

Influence of aircraft design and nonlinear aerodynamic parameters on the poststall stability and control of aircraft. Employment of current experimental techniques and development of equations pertaining to developed spin and recovery characteristics. Prerequisite: ME 275 or approval of department.

280 **Intermediate Thermodynamics** (3)

Thermodynamic systems; Gibbs equation; potentials, thermodynamic relationships, equilibrium and stability. Statistical thermodynamics; probability and macrostates; properties of perfect gases, mixtures and crystals. Elements of kinetic theory and its application to transport properties. Introduction to relativistic thermodynamics. Application to chemical reactions, thermal radiation, magnetic, electric and solid systems. Prerequisite: approval of department.

281 **Nonequilibrium Thermodynamics** (3)

Molecular theories of gases; thermodynamic properties and Boltzmann's integro-differential equation, the H theorem and entropy; equations of state and potentials; the equation of change and velocity distribution outside equilibrium; transport properties. Field theory. Constitutive, balance and Gibbs equations. Variational principles. Application to transport processes in engineering systems. Prerequisite: ME 280.

290 **Kinetic Theory of Gases** (3)

Equation of state and physical properties for gas composed of discrete particles, relation of kinetic theory to thermodynamics; Maxwell distribution of molecular velocities; Boltzmann H theorem. Molecular interactions, free paths, collision rates, scattering coefficients. Introduction to diffusion, viscosity, heat conduction; imperfect gases; flow of gases at low density. Prerequisite: ME 280.

297 **Special Topics in Fluid Mechanics** (3)

Prerequisite: approval of department.

298 **Research** (arr.)

Research as arranged. May be repeated for credit.

299–300 **Thesis Research** (3–3)

398 **Advanced Reading and Research** (arr.)

Limited to students preparing for the Doctor of Science qualifying examination. May be repeated for credit.

399 **Dissertation Research** (arr.)

Limited to Doctor of Science candidates. May be repeated for credit.

Economics

Chairman: C.T. Stewart, Jr., Professor of Economics; C-624, Telephone 676-6150

Departmental prerequisite: Econ 1 2 is prerequisite to all other courses in economics except Econ 217–18 and 220.

1–2 **Principles of Economics** (3–3)

Lecture (2 hours), discussion (1 hour). Survey of the major economic principles, institutions, and problems in contemporary life. Econ 1: macroeconomics; Econ 2: microeconomics.

101 **Intermediate Microeconomic Theory** (3)

Analysis of supply, demand, and pricing.

102 **Intermediate Macroeconomic Theory** (3)

Theories of national income determination and growth.

121 **Money and Banking** (3)

Nature of money, credit, commercial banking, and other financial institutions in the U.S. monetary system.

217–18 **Survey of Economics** (3–3)

For graduate students in fields other than economics. Econ 217: price theory. Econ 218: income and employment theory. Departmental prerequisite waived.

220 **Survey of Principles and Issues in Economics** (3)

Survey of economic theory and its application to contemporary economic problems. Departmental prerequisite waived.

236 **Economics of the Environment and Natural Resources** (3)

Analysis of public policy problems relating to the environment and natural resources development and management.

241–42 **Labor Economics** (3–3)

Theory of wages and employment, analysis of labor supply and demand. Structural unemployment; occupational choice; labor market discrimination.

243 **Seminar: Manpower Policy** (3)

Developments leading to expansion of public investment in manpower resources; evaluation of goals and operations of publicly supported programs. Open to undergraduates.

247 **Seminar: Industrial Organization** (3)

Selected topics in regulatory economics and in antitrust economics during alternate years. Prerequisite: Econ 101 or equivalent.

253 **Productivity Analysis** (3)

Concepts, measurement, and analysis of productivity in business and government at aggregate and organizational levels.

259 **Income Distribution** (3)

Theoretical and empirical analysis of income distribution, including analysis of policies related to income inequality. Open to advanced undergraduate economics majors.

Education

Chairman: John Boswell, Professor of Education; C-504, Telephone 676-6940

Departmental prerequisite: A degree from an accredited institution and adequate professional preparation are prerequisite to courses in Education numbered from 201 to 400.

100 **Special Workshop in Education and Human Development** (arr.)

Topics to be announced in the *Schedule of Classes*. May be repeated for credit.

101 **Career Choices in Education and Human Services** (3)

Introduction to the wide variety of careers available in education and human development services: early childhood through college, museum, rehabilitation, industry, publishing, community, recreation, tourism, and government settings. Visits to selected sites.

112 **Measurement and Evaluation** (3)

Basic evaluative measurement techniques: selection, administration and interpretation of standardized tests; test construction, evaluation procedures, statistical analysis.

128 **Children's Literature** (3)

Lecture (2 hours), field work (2 hours). Newer books for children and the children's classics, contribution of literature to child development.

133 **Supervised Experience in Education and Human Development Services** (3 to 6)

Field work, internship, and instructional practice: (1) adult education and human resource development; (2) college student development experience; (3) higher education; (4) museum education; (5) counseling. Admission by permission of instructor.

162 **Foundations of Counseling** (3)

Introductory survey—definitions, scope, principles, historical background, organization, services, emerging trends, and issues.

200 **Special Workshop in Education** (arr.)

Topics to be announced in *Schedule of Classes*. May be repeated for credit.

205 **The Curriculum** (3)

For experienced teachers. Curriculum foundations and issues, comparison of curriculum patterns, curriculum development in subject areas, and group consideration of student problems.

207 **Curriculum Materials** (3 to 6)

For experienced teachers. Construction of courses of study and classroom teaching aids, with direct application to students' situations.

208 **Human Development** (3)

Consideration of human development and behavior throughout the life span; emphasis on practical implications of relevant interdisciplinary research.

209 **Child Development** (3)

Interdisciplinary approach to child development and behavior. Practical implications of research in disciplines contributing to knowledge about childhood.

210 **Adolescent Development** (3)

Interdisciplinary approach to adolescent development and behavior. Practical implications of research in disciplines contributing to knowledge about adolescence.

212 **Quantitative Methods I: Introduction to Survey Measurement and Research** (3)

Introduction to measurement techniques and evaluation. Emphasis on application and interpretation of data gathering techniques and descriptive statistics.

213–14 **History of Education** (3–3)

Educ 213: education as a major factor in the development of world civilization from the invention of writing to the industrial revolution. Educ 214: evolution of the American school system.

217–18 **Philosophy of Education** (3–3)

Educ 217: to help students formulate a personal philosophy of education. Educ 218: social foundations of education—forces that shape policies and offerings of the school.

219 **Elementary School Classroom Procedures** (3)

Current theories of teaching and learning and their application to teaching strategies of elementary school teachers.

222 **Foundations of Reading Instruction—Early Childhood and Elementary School** (3)

Historical and psychological background; readiness, special approaches and skills for beginning and elementary readers; evaluation of materials; demonstrations of diagnostic, classroom, and instructional techniques.

223 **Foundations of Reading Instruction—Intermediate and Secondary School** (3)

Emphasis on content areas; historical overview and need for teaching reading on these levels; informal diagnostic techniques and teaching; selecting materials; basic reading and study skills and their application in content areas.

224 **Diagnostic Teaching of Reading** (3)

Classroom diagnostic and instructional techniques for elementary school level; construction of informal tests; administration, scoring, and interpretation of informal and standardized tests; study of materials and application of readability formulas. Prerequisite: at least one previous course in reading.

226 **Reading in Secondary School** (3)

Extension of diagnostic and instructional techniques in Educ 223; construction of informal tests; administration, scoring, and interpretation of informal and standardized tests; evaluation of materials, including application of readability formulas; study of reading programs. Permission of instructor required.

227 **Basic Issues in Elementary Education** (3)

Identification, definition, and analysis of some of the most important problems facing the contemporary American elementary school.

228 **Instructional Areas in Elementary Education** (3)

Current trends and research in reading, language arts, social studies, mathematics, science, music, art, and physical education.

233 **Audiovisual Education** (3)

Lecture (2 hours), laboratory (1 hour). Selection, evaluation, and use of audiovisual materials; administrative problems in care, operation, maintenance, and use of such materials and equipment. Material fee, $7.

235 **Analysis of Teaching** (3)

Teaching as work: diagnosing learning skills, program planning and implementation, feedback information on both student and program.

236 **Introduction to Education Technology** (3)

Consideration of historical perspective, process, instrumentation, and implementation of self-instructional systems.

237 **Systems Approach to Instructional Design** (3)

Application of systems techniques to the development of instructional programs. A workshop design, using multi-media instruction.

241 **Education of the Gifted** (3)

For classroom teachers. Nature and discovery of giftedness, provision for the gifted in regular classes, experimental projects.

242 **The Teacher and School Administration** (3)

Role of federal, state, and local administrative units; school finance, legal controls, school plant; public support; improving teaching conditions.

243 **Human Relations in Education and Management** (3)

Principles and practices in human relations between and among learner, teacher, and other school personnel, parents, and community.

245 **School and Community** (3)

The school as an important member of a team of social agencies that builds the community.

247 **Post-Secondary Occupational Education** (3)

Development, current concepts, agencies involved, problems and trends in vocational, technical, and occupational education in the United States, with emphasis on the community college.

248 **The Teacher and School Supervision** (3)

Nature, organization, human relationships, and techniques.

250 **Counseling Drug Abusers** (3)

Counseling theory and practice applied to drug abusers. Crisis intervention, self-help groups, and family therapy; individual and group counseling.

251 **Foundations of Counseling** (3)

Introductory survey: definitions, scope, principles, historical background, organization, services, emerging trends, and issues.

252 **Organization and Administration of Counseling Services** (3)

Principles and procedures for designing and implementing counseling services. Admission by permission of instructor.

253 **Individual Appraisal in Counseling** (3)

Detailed study of individual analysis and appraisal techniques. Development of systematic case study. Prerequisite: Educ 112 or equivalent.

254 **The Middle School** (3)

Development, organization, and practices; emphasis on the learner, the teacher, the administrator, the curriculum, and the setting of the school for the preadolescent.

255–56 **Secondary Education** (3–3)

Examination of historical, psychological, sociological, and philosophical bases; emphasis on prescriptive implications. Special attention to contemporary problems and practices.

257 **Career Development and Information** (3)

Theories of career development, factors influencing the world of work; procedures for evaluating and using socio-personal, educational, and occupational information.

258 **Theories and Techniques of Counseling** (3)

Theories and practices of vocational, educational, and personal counseling. Prerequisite: 12 semester hours in guidance and counseling, including Educ 253 and 257.

259 **Administration of the Elementary and Secondary School** (3)

For experienced teachers and administrators. Survey of administration, including practices of modern schools.

260 **Supervision in the Elementary and Secondary School** (3)

For experienced teachers and administrators. Review of modern supervisory concepts, including practices in schools.

261 **Practicum in Counseling and Human Development** (3)

Intensive counseling experience under supervision. Emphasis on relationship dynamics, analysis, recommendations and follow-up. Separate sections offered for counseling majors and human development majors. Prerequisite: Educ 258.

263 **Human Resource Development: Training and Education** (3)

Concepts and purpose, historical backgrounds, roles of human resource development personnel, program areas. Prerequisite: adequate professional preparation or experience in training, education, and development.

264 **Design of Training Programs in Human Resource Development** (3)

Training, education, and development programs for various client systems will be planned using critical events conceptual model. Field work. Prerequisite: Educ 263 and permission of instructor.

269–70 **School Business Management** (3–3)

Educ 269: philosophy, responsibilities, and functions of the business management office in public education institutions. Educ 270: practicum in educational business management.

275 **School Finance** (3)

Educational financial theory, practice, and control, including methods of financing.

276 **Public Relations in School Administration** (3)

Purposes, gathering materials, disseminating agencies, publicity media, public participation in policy-making.

278 **School Law** (3)

Sources and scope of school law; legal rights and responsibilities of teachers, pupils, and taxpayers. Other legal problems of major interest to the group.

283 **Higher Education in the United States** (3)

History, scope, purpose, present status, programs and trends in higher education in the United States.

284 **Administration of Higher Education** (3)

Government, organization, and administration of colleges and universities; duties of trustees and administrators.

285 **Program Planning, Organization, and Coordination** (3)

Focus on the skills and knowledge needed by student affairs professionals, faculty advisors, and college administrators in planning, budgeting and dealing with policy issues related to campus programming. Includes program proposal preparation.

289 **Organization and Administration of Reading Programs** (3)

For principals, assistant principals, supervisors, superintendents and reading teachers. Problems in planning, reorganizing and improving the total reading program.

291 **Planning the School Plant** (3)

Selection of sites; evaluation of existing buildings; utilization of present facilities; adaptation to curricular needs; building, operation, and maintenance problems.

295 **Quantitative Methods II: Research Procedures** (3)

Required of all candidates for master's degrees in education. Analysis of scientific approaches to problems in education; evaluation of research techniques. Prerequisite: Educ 112, 212; or equivalent.

297 **Personnel Administration** (3)

Organization and administration of personnel programs for educational institutions. Basic philosophy, principles, responsibilities, and functions.

299–300 **Thesis Research** (3–3)

Required of M.A. in Ed. degree candidates writing master's theses.

302 **Quantitative Methods III: Inferential Techniques** (3)

Educ 302 or Stat 105 is required of all doctoral students in education. Prerequisite: Educ 212 or a basic statistics course and permission of instructor.

304 **Practicum in Supervision** (3 to 6)

Practical experience in supervision of instruction. Admission by permission of instructor.

306 **Quantitative Methods IV: Advanced Research Design** (3)

Required of all doctoral students in education. Evaluation and application of educational research designs. Prerequisite: Educ 302 or equivalent.

316 **Recent Developments in Elementary School Social Studies** (3 to 6)

For experienced educational personnel. Research, techniques, materials, and innovative programs relating to the effective elementary school social studies curriculum. Admission by permission of instructor.

317 **Recent Developments in Elementary School Science** (3 to 6)

For experienced educational personnel. Research, techniques, materials, and innovative programs relating to the effective elementary school science curriculum. Admission by permission of instructor.

320 **Recent Developments in Elementary School Mathematics** (3 to 6)

For experienced educational personnel. Research, techniques, materials, and innovative programs relating to the effective elementary school mathematics curriculum. Admission by permission of instructor.

324 **Teaching Reading and Study Skills at the College Level** (3)

Evaluation of reading skills at the college level. Development of college reading programs, including diagnostic and teaching techniques, program planning and implementation. Prerequisite: Educ 226 or equivalent, and permission of instructor.

325 **Curriculum Theory** (3)

Examination of reviews and research studies in curriculum theory. Focus on trends, values, interpretations, fads, design systems, and evaluation.

353 **Counseling Older Persons** (3)

Special considerations and counseling emphases on second careers, retirement adjustments, death and dying.

354 **Cross-Cultural Counseling** (3)

Problems of and procedures for counseling culturally different clients. Emphasis on counseling cultural minorities in the United States.

355 **Counseling in Groups** (3)

Principles of group dynamics as related to interaction within groups. Techniques and practice in group counseling.

357 **Personal and Social Adjustment** (3)

Mental health problems; emphasis on needs of counselors, teachers, and others working with children and adolescents.

363 **Psychosocial Aspects of Rehabilitation Counseling** (3)

Impact of congenital and later disabilities on attitudes, self concepts, and motivations. Implications for rehabilitation counseling. Admission by permission of instructor.

370 **College Students and Their Community** (3)

Survey of literature on the characteristics, behavior, and attitudes of the contemporary college student; college students' interaction with their environment. Admission by permission of instructor.

371 **Principles and Practices in College Teaching** (3)

General principles, methods, techniques, and experimental instructional media for teaching at the college and university level.

372 **Internship in College Teaching** (3 to 6)

Supervised experience in a selected area of college teaching. Prerequisite: Educ 371. Admission by permission of instructor.

373 **The Community-Junior College** (3)

The two-year college as it relates to secondary education, four-year colleges and universities. Objectives, curricula, students, faculty, legal concerns, and special problems of two-year colleges.

374 **Current Issues in Higher Education** (3)

Prerequisite: Educ 283, 284.

375 **Foundations of College Student Development** (3)

College student development as an integral part of higher education programs.

380 **Sensitivity Training: Laboratory Method** (3)

A sensitivity learning experience in human relations using unstructured group experience, individual feedback, experimentation, and practice. Admission by permission of department, prior to registration.

381 **Adult Learning** (3)

Learning theories as applied to adults in individual and group learning transactions; effect of age on learning; psychological, physical, and social environment in adult education situations.

382 **Instructional Strategies in Adult Learning Programs** (3)

Methods, techniques, and devices for adult learning; developing action-oriented learning situations in adult learning programs.

383 **Interviewing-Counseling for Human Resource Developers** (3)

Applications of interviewing, coaching and counseling skills for the human resource development specialist and others in various occupational settings.

384 **Evaluation of Adult Learning Programs** (3)

Evaluation of adult learning programs in business, industry, government, voluntary and community organizations, and agencies.

385 **Collective Negotiations in Higher Education** (3)

Theory, practice, problems, and issues in collective negotiations in higher education.

386 **Current Issues in Adult Learning Programs** (3)

For M.A. in Ed. degree candidates. Current issues and trends in the fields of adult education and human resource development. Admission of others by permission of instructor.

387 **Administration of Adult Learning Programs** (3)

Program administration in school and non-school agencies, staff recruitment and development, fiscal operations, facilities, and maintenance of effective community relations.

389 **Consultant-Client Relationships in Human Resource Development** (3)

Examination of the consulting process, consultant-client behaviors, and dilemmas using theory and field experience for individual and organizational development. Prerequisite: Educ 264, 280 *Program Planning in Adult Education (3);* or approval of instructor.

390 **Legal Problems in Higher Education** (3)

Investigation of legal problems in higher education related to the legal structure of higher education, religious concerns, students, faculty, and academic programs.

391 **College and University Curriculum** (3)

Development, patterns, creative design, issues, problems, evaluation, and trends in the higher education curriculum.

392 **Financing Higher Education** (3)

Analysis of private, state, and federal revenue sources; student aid, program budgets, and financial methods and practices.

393 **Practicum in Higher Education** (3 to 6)

Supervised field experiences in higher education; reports and conferences. Admission by permission of instructor.

394 **College and University Governance** (3)

Organizational and administrative structures, patterns, and relationships in higher education. Prerequisite: Educ 284.

395 **Problems and Practices in Educational Administrative Organization** (3 to 6)

Application of principles and practices concerned with change and evaluation of educational administration.

399 **Seminar: Applied Educational Administration** (3 to 6)

Application of the theories and principles of administration to the public schools. Student participation with guidance by recognized regional practitioners.

lectrical Engineering and Computer Science

hairman: Raymond Pickholtz, *Professor of Engineering and Applied Science;* opkins 107, Telephone 676-6083

CTRICAL ENGINEERING

152 **Introduction to Microcomputers** (3)

Introduction to the structure of microprocessors and microcomputers. Representation of information in the computer. Logic and storage devices. Processor structure, registers, transfer of information and control. Programming in microcomputers. I/O structure and auxiliary electronics. Interrupt structures, direct memory access. LSI and its implication for microcomputers. Arithmeter operations. Different microcomputer architectures. Prerequisite: CSci 153 or permission of instructor.

153 **Design of Switching Systems** (3)

Introduction to switching logic and combinatorial circuits. Analysis of switching devices. Minimization techniques. Number systems and codes, encoders and decoders, logic and electronic design of functional digital units. Use of LSI in logic design. Introduction to sequential circuits. Minimization of sequential machines. Design of synchronous, asynchronous, and pulse sequential circuits. State-assignment and covers.

201 **Natural Modes and Transients in Electrical Systems** (3)

Transient response and natural modes of electrical systems; techniques for analyzing systems with periodic and aperiodic inputs and outputs; Fourier and Laplace transforms. Inversion, integration in the complex plane. Sampling; discrete systems, Z-transforms, applications. Prerequisite: graduate status.

202 **Linear System Theory I** (3)

Graph theory and its application to networks and systems; system description in time and frequency domain; linear spaces and linear operators, mathematical representation of linear systems; analytical and computer solutions of the state equations; transient and steady-state response. Prerequisite: graduate status.

203 **Linear System Theory II** (3)

System properties; controllability and observability of linear systems; sensitivity and stability analyses. Irreducible realizations of rational transfer-function matrices; canonical forms, state feedback, and state estimators. Linear composite systems. Prerequisite: EE 202.

204 **Stochastic Signals and Noise** (3)

Probability, random variables, characteristic functions; transformations of random variables and applications; sequences of random variables, linear mean-squared estimation; stationary estimation, stationary random processes, correlation functions, power spectrum; output of linear systems with stochastic inputs; Gaussian processes. Applications drawn for communications, control theory, computer science.

224 **Electronics of Lasers** (3)

Basic concepts from quantum mechanics; Einstein coefficients; inversion and pumping mechanisms; rate equations. Resonators, He-Ne laser; organic dye lasers; injection lasers. Nonlinear interactions in lasers. Prerequisite: EE 222 *Physical Electronics II* (3) or equivalent.

241 **Information Theory** (3)

Measure of information, noiseless coding; communication channels, channel capacity, the noisy channel coding theorem; bounds on the performance of communication system; the Gaussian and binary symmetric channel; feedback communications systems; rate-distortion theory. Prerequisite: EE 204.

242 **Coding Theory** (3)

The PCM Communication System, mathematics of coding; groups, rings, and fields, linear codes; parity and generator matrices, syndromes error correction and deletion capability, minimum distance; performance bounds of linear codes, Hamming and Golay codes, polynomial algebras and Galois fields, shift-register implementation, cyclic codes; implementation and performance, BCH codes; encoding, decoding, minimum distance, the *BCH* decoding algorithm, burst-correction codes, convolutional codes, sequential and Viterbi decoding of convolutional codes.

243 **Communication Theory I** (3)

Optimum receivers for vector channels and for the additive white Gaussian noise channel; correlation detectors, matched filters; coherent and noncoherent detection and their error probabilities for simplex, orthogonal, and coded systems; bounds on the performance of communications in Gaussian noise; comparison of communications systems. Prerequisite: EE 204 or equivalent.

244 **Communication Theory II** (3)

Schemes for efficient signalling for data sequences; effects of quantizing at the receiver. Practical implementation of orthogonal and simplex coded communication. Convolutional codes; bounds on performance decoding by

sequential (Zigangirov-Jelinek, Fano) and MAP (Viterbi) algorithms. Fading and dispersive channels, diversity techniques and their performance. Topics from analog communications. Prerequisite: EE 243.

245 **Signal Detection and Estimation Theory** (3)

Statistical detection theory, hypothesis testing, sequential detection, estimation theory, maximum likelihood and Bayes methods, estimation of signal parameters and continuous wave forms, Wiener and Kalman filters, applications to the design of optimum receivers, adaptive systems. Prerequisite: EE 241, 244; or equivalent.

*250 **Telecommunication Systems Concepts** (3)

Essential elements of an electrical communication system, speech, TV, and data signals; spectrum, bandwidth, sampling. Amplitude, frequency and pulse code modulation and comparative performance. Multiplexing schemes, communication quality standards and objectives. Signal power, noise power, distortion, and channel capacity. Probability, traffic theory, reliability, voice, TV, and data transmission. Telecommunication, microwave radio, cable, and satellite communications systems.

*251 **Survey of Telecommunication Systems** (3)

Design of a communications link for voice, TV, and data. Loading; the switched telephone network. Transmission system layout and major design considerations. Overall system design of microwave radio system. Radiowave propagation fundamentals. Satellite communications, factors affecting the choice of orbit and orbital separation of satellites, satellite transponder. Major design consideration and values of significant parameters for a typical satellite communications link. Overall design of a cable communicaion system. Digital transmission and terminals. Wide-band data transmission. Frequency allocation.

298 **Research** (arr.)

Research as arranged. May be repeated for credit.

299-300 **Thesis Research** (3-3)

399 **Dissertation Research** (arr.)

Limited to Doctor of Science candidates. May be repeated for credit.

OMPUTER SCIENCE

201 **Introduction to Computer Systems I** (3)

Introduction to programming digital computers in assembly languages. Architecture of traditional von Neumann and stack-based computers. Techniques in machine control and memory addressing. Number systems and codes. Techniques of structured programming. Use of a higher-level procedural language. Stacks and recursion. Prerequisite: CSci 51, EE 51 or equivalent.

202 **Introduction to Computer Systems II** (3)

Introduction to combinational and sequential logic networks; analysis and synthesis of switching circuits using Boolean algebra; minimization techniques in the design of logical circuits; number systems and arithmetic in digital computers, digital computer architecture and the design of functional sub-units; design of memory, arithmetic, and units comprising a

E 250 and 251 cannot be applied toward a graduate degree in the School of Engineering and ied Science.

digital computer; information flow, timing, and control in large digital computers. Prerequisite: CSci 201 or its equivalent, or permission of instructor.

214 **Data Structures and Algorithms** (3)

Computer data structures and their implementation as storage structures. Arrays, linked lists, and queues. Binary tree traversal, searching, threading, and balancing. Storage management—allocation, de-allocation, and garbage collection. Search algorithms—linear, binary, and hashing. Sort algorithms. Analysis of algorithms. Structure and processing of sequential, index-sequential, and random files. Multi-list and inverted files. Prerequisite: CSci 158 *Algorithmic Methods and High-Level Languages* (3) or 201; 208 *Computer Programming* (3) (may be taken concurrently); 213 *Computer-aided Analysis and Design of Networks* (3); of permission of instructor.

219 **Interactive Computer Graphics** (3)

Architecture and implementation of display and interaction devices. Interactive graphics programming. Functional capabilities of graphics packages. Implementing a graphics package. 2D and 3D viewing, clipping and transformations. Interaction techniques and human factors. Raster graphics scan-conversion algorithms. Hidden surface and hidden edge removal algorithms. Shading and texturing techniques. Prerequisite: CSci 214 or permission of instructor.

237 **Computing Systems** (3)

Organization of large digital computer systems. Design of high-speed arithmetic units. Random access and associative memories; rotational storage devices; computer control and interrupt structures. Input-output channels and interfacing problems. Communications in digital computers. Introduction to multiple access and time-sharing systems. Prerequisite: CSci or EE 154 *Digital Computer Design* (3) or CSci 202.

255 **Formal Languages, Correctness, and Structured Programming** (3)

Introduction to formal computer languages. Structured programming and block-oriented languages. Regular, context-free, context-sensitive, and unrestricted computer grammars. Parsing a language, syntax of languages, pushdown automata and their use in compiling. Top-down structured programming. Avoidance of GO TO statements. Correctness, termination, and equivalence of programs. The inductive assertion method. Termination methods based on well-ordered sets. Assertion languages, program schemes, fixed point methods, and inductive principles. Prerequisite: CSci 214.

263 **Digital Computer Programming Systems** (3)

Design of computer systems software. Design and programming of an assembler and loader. Multiprogrammed job control, including linking, loading, linkage-edit, relocatability, region size, and status switching. Design of dispatchers and monitors. Design of utility programs. Input-output programming and control. Communications among components of the operating system. Prerequisite: CSci 208 *Computer Programming* (3); 214.

Engineering Administration

Chairman: Sam Rothman, *Professor of Engineering Administration;* Staughton 301, Telephone 676-7409.

150 **Introduction to Engineering Administration** (3)

The interrelationships of engineering, science, and management; conceptual foundations for interaction of human factors in individuals, groups, and the social environment of engineering activities. Familiarization with typical activities of engineering managers and with factors bearing on the motivation of engineers and on engineers as managers. Social and organizational factors relevant to the management of engineers. This course is preliminary to the complete management process studied in EAd 211–12.

160 **Introduction to Engineering Economic Analysis** (3)

Economic decisions, equivalence, mathematics of finance, present worth, annual cost or profit, internal rate of return, benefit cost ratio, incremental analysis, multiple alternatives, economic decisions under risk, inflation, depreciation methods, balance sheets, profit and loss statements, the accountant's view, and before- and after-tax analysis.

170 **Basic Quantitative Methods for Engineering Administration** (3)

An introductory treatment of quantitative tools and techniques important in engineering administration. Concepts of probability, statistics, and operations research.

204 **Administration of Engineering Contracts** (3)

Study of the total contracting process, including initial budget preparation and justification, actions leading to the execution of a contract, and administration of the contract to completion; considered from the viewpoints of the industrial and government buyer and the seller of technical materials and services.

207 **The Personnel Function for Engineering Administrators** (3)

Principles of managing human talent, the most vital resource in engineering or research; emphasis on principles, theory, and practical considerations of the personnel function for engineering managers, with practical applications in an engineering administration environment.

210 **Engineering Law** (3)

Legal principles and procedures of interest to engineers. The American legal system, contracts and specifications, liability of professional engineers, product liability, agency relationships, patent and proprietary rights, special problems in research and developmental contracts.

211–12 **Engineering Administration** (3–3)

Comprehensive and systematic study of the administrative process; industrial, scientific, and engineering environments. Planning: objectives, prediction, policies, and characteristics of plans. Organizing: theory of organization, structure, authority, specialization, delegation, staff, and committees. Directing: leadership, managing human and material resources. Controlling: setting standards, evaluating performance, using system feedback data for correction and improvement. Prerequisite: EAd 150 and 160, or equivalent.

221–22 Environmental Management (3–3)

The spectrum of technical, economic, political, administrative, and social forces influencing the quality of our environment and the utilization of our resources. Review of governmental and industrial programs to combat pollution of the air, land, and water. Historical development of legislation dealing with environmental science and resource management. Review of pending legislation involving environmental and energy matters; theoretical aspects of specific management problems; review of tools for decision making.

231 Program Management (3)

Programs and projects are widely used in industry and government to facilitate the management of technical undertakings. Management science, the systems approach, and traditional managerial concepts are applied to a variety of typical cases.

241 Construction Management I (3)

Contract negotiations; aspects of contracts and specifications important to management. Construction estimating and cost allocation in heavy and building construction; budgeting and accounting concepts.

242 Construction Management II (3)

Construction administration: organization, construction planning, and scheduling. Industrial relations and human factors in construction management, work measurement, programming and progressing, project management and control.

243 Construction Management III (3) (Campus Course)

Managerial problems associated with advanced methods of construction and equipment; trend of mechanization; equipment policy and depreciation.

251 Management of Computer Organizations (3) (Campus Course)

Planning, organizing, and control of computer operations. Management of a computer organization as an independent service bureau or as an integral part of a larger organization. Supervision of professional and subprofessional computer personnel. Prerequisite: EAd 254.

253 Production Management (3) (Campus Course)

Planning, organization, and control of production; forecasting techniques; material management; methods of loading and scheduling production processes; electronic methods in production control. Organization and administration of the plant engineering function with emphasis on maintenance control programs.

254 Automatic Data Processing Systems (3)

Logic of computers, hardware and software, systems analysis for data processing applications, systems design, systems economics. Impact on decision-making, business, and society.

255 Administration of Research and Development (3)

The study of technological innovation as a vital part of the acquisition process; the role of the technical administrator in utilizing organization, plans, and control to accomplish research and development objectives.

261 Economic Analysis in Engineering Planning (3)

Case studies in engineering economic planning, advanced problems in

engineering economy. Prerequisite: EAd 160 or an equivalent course in engineering economy, and permission of instructor.

262 **Finance for Engineers** (3) (Campus Course)

Exposition of the financial concepts encountered in engineering situations; financial statements, costing, inventories, profitability analysis, depreciation, credit, leasing, and capital formation.

265 **Transportation Management I** (3) (Campus Course)

Integration of social, technical, economic, and political considerations which shape transportation systems and their management. Course material focuses on industry and local, state, and federal government programs in transportation. A management study of a local, regional, or national system will be required.

266 **Transportation Management II** (3) (Campus Course)

Legal aspects of transportation systems and their management.

269 **Elements of Decision-Making and Problem-Solving** (3)

Concepts and quantitative techniques of scientific method in solving administrative problems. Role of decision criteria and subjective factors. Managerial economics. Model building, testing, solving. Replacement under certainty or risk. Control-general, control charts, sampling inspection. Experimentation to differentiate variables, build models-canons of induction, statistical tests, analysis of variance, linear regression. Application to nonmathematical formulations.

281 **Systems Analysis and Management I** (3)

The systems or holistic approach as a methodology for making decisions and allocating resources. Analysis by means of objectives, alternatives, models, criteria, and feedback.

282 **Systems Analysis and Management II** (3)

Extension and elaboration of systems analysis techniques, including their application to industry, input-output structures, human behavior in organizations, and military situations. Prerequisite: EAd 281.

283 **Systems Engineering** (3) (Campus Course)

Concept of system structure and organization. Linear and nonlinear systems analysis; dynamics and stability of systems. Introduction to optimization methods and systems simulation techniques.

285 **Seminar: Administrative Problems** (3) (Campus Course)

Individual analysis of complex administrative problems, with group evaluation and discussion. Prerequisite: 18 semester hours of graduate credit.

287 **Systems Modeling and Simulation** (3) (Campus Course)

Introduction to systems modeling and simulation dealing primarily with industrial, organizational, and control models. Emphasis on analyzing the system performance and designing an improved system using analytical or simulation techniques. Prerequisite: EAd 281, 283, or equivalent, and permission of the instructor.

288 **Technical Issue Analysis—The Engineering Approach** (3) (Campus Course)

A seminar for technical managers who need the contextual background and intellectual basis for addressing technology issues in the public and

private sectors. Technology impact analysis, technology forecasting, and the principles and practices of technology transfer are treated as elements of a systematic approach to informed choice and sound technology decisions.

291 **Structural Analysis of Management Problems** (3) (Campus Course)

Application of each phase of a structured problem-solving approach to small-scale management problems. Students will determine problem symptoms; define problems; select a problem; determine constraints on solutions and alternative feasible solutions; develop the solutions, select one, test that solution, plan controls on it, and plan its implementation. Prerequisite: EAd 269.

293 **Technical Enterprises** (3) (Campus Course)

Essential features of technology-based companies from the entrepreneur's point of view. Team management of an enterprise in a computer-simulated environment. For those within technical firms and those within government who depend on technical firms as suppliers.

294 **Marketing of Technology I** (3) (Campus Course)

Marketing industrial goods and high-technology projects; special attention to the federal government as a market. Products, channels, pricing, promotion, and personal selling as elements of strategy.

295 **Management of Technical Information** (3) (Campus Course)

Needs and objectives of technical information systems, functions involved in technical information, storage and retrieval, abstracting, computer usage in technical information systems, system organization. Prerequisite: EAd 251.

297 **Problems in Engineering Administration** (3)

Project course providing the student with the opportunity to apply the various concepts and tools previously studied to the solution of a problem in engineering administration. Students work individually or in small groups, each on a problem proposed by the student and approved by the instructor. Open to Master's degree students only. Departmental approval required.

English

Chairman: J.P. Reesing, Jr., Professor of English; Stuart 407, Telephone 676-6180

Before students are registered in Engl 10, they are tested in the minimum essentials of vocabulary, spelling, grammar, standard usage, and writing skill. Those students who show marked superiority may be exempted from one or both halves of the English Composition course; those who are inadequately prepared for Engl 10 will be given permission to register for Engl 9 on campus. Engl 9 or 10 is prerequisite to all other courses in English.

ENGLISH AS A FOREIGN LANGUAGE

20 **Intensive Basic English** (0)

Basic grammar, reading, and vocabulary development; emphasis on oral skills. Course meets fifteen class hours and five monitored laboratory

hours per week. Tuition is charged at the rate of eight semester hours; laboratory fee, $35.

30 **Intensive Lower-Intermediate English** (0)

Introduction of complex grammatical structures, intensive reading, paragraph-level writing, and further vocabulary development and oral practice. Course meets fifteen class hours and five monitored laboratory hours per week. Tuition is charged at the rate of eight semester hours; laboratory fee, $35.

40 **Intensive Higher-Intermediate English** (0)

Comprehensive review of grammatical structure, enlargement of vocabulary through use of unadapted and technical reading material; development of effective reading strategies; composition focusing on outlining and techniques of exposition. Twenty hours per week including laboratory. Tuition is charged at the rate of eight semester hours; laboratory fee $35.

45 **Semi-Intensive Higher-Intermediate English** (0)

Objectives same as for EFL 40. Academic courses may be taken concurrently with appropriate authorization. Ten class hours per week. Tuition is charged at the rate of five semester hours.

50 **English Composition/Research Methods for International Students** (3)

An advanced-level composition course for students showing a high degree of academic proficiency in English. Four class hours per week. Special fee, $25.

NGLISH COMPOSITION

9 **English Composition: Language as Communication** (3) (Campus Course)

Intensive grammar and composition course for students inadequately prepared for Engl 10. Detailed instruction, drill, and exercises in basic structure and writing paragraphs; also includes content covered in Engl 10. In addition a noncredit reading course, given by the Reading Center, is required for students whose test scores show a reading deficiency. Engl 9 meets five hours per week and carries three semesters hours of credit; the reading course meets an additional three hours per week for a maximum of 10 weeks. Special fee, $25.

10 **English Composition: Language as Communication** (3)

Study and practice of expository techniques; emphasis on the rhetorical complexities of unity, development, organization, and coherence, by analysis of selected current prose; library research procedure.

11 **English Composition: Language and the Arts and Sciences** (3)

Study and practice of expository and argumentative techniques; emphasis on the rhetorical complexities of the sentence and diction, and on logical thought, by analysis of selected readings on the nature of language and of the arts and sciences. Prerequisite: Engl 9 or 10.

20 **The Writing of Reports** (3)

Theory and practice in the writing of technical reports. Prerequisite: Engl 9 or 10 and 11.

HUMANITIES

43–44 Classical Humanities (3–3)

Interdisciplinary study of the origins of Western thought. Reading and intensive class discussion of selections from the Bible, Engl 43; and discussion each semester of works from five of the following authors: Homer, Hesiod, Aristophanes, Plato, Aristotle, Aeschylus, Euripides, Sophocles, Herodotus, Thucydides, Lucretius, Marcus Aurelius, Epictetus, Polybius, St. Augustine. Background lectures on the major intellectual, artistic, economic, and social movements.

45–46 Humanities in the Modern World (3–3)

Interdisciplinary study of modern Western thought from the Renaissance to the 20th century. Reading and intensive class discussion each semester, of works from five of the following authors: Machiavelli, Pope, Voltaire, Rousseau, Goethe, Tolstoy, J.S. Mill, Zola, Nietzsche, Kierkegaard, Freud, Kafka, Koestler, T.S. Eliot. Background lectures on the major intellectual, artistic, economic, and social movements.

ENGLISH LITERATURE

51–52 **Introduction to English Literature** (3–3)

Representative works by major authors studied in their historical context; discussion of recurrent themes, and introduction to various types and forms of imaginative literature.

AMERICAN LITERATURE

71–72 **Introduction to American Literature** (3–3)

Historical survey. Engl 71: From beginnings to the Civil War. Engl 72: From the Civil War to present.

Environmental Health*

For further information call David A. Rowley, Assistant Dean, Graduate School of Arts and Sciences, Telephone 676-6210

201 **Introduction to Epidemiology and Environmental Health** (3)

Open to qualified graduate students. Principles and methodology of epidemiology and biostatistics. Ecological approach to health and disease, including parasitology and mycology.

231 **Venereal Disease in the Community** (3)

A survey course to develop an understanding of venereal disease problems. Etiology, clinical manifestations, diagnosis, prevention, and control. For parents, school teachers, health personnel, and other educators.

240 **Environmental Impact Statement Procedures and Environmental Law** (3)

The rationale for environmental impact statements from the viewpoint of the nature and origins of the environmental crisis. Government agencies responsible for environmental impact statements, current statutes and regulations pertaining to the environment.

* These courses are included in certain interdepartmental programs of the Master of Arts, Master of Science in Special Studies degree which is under the academic jurisdiction of the Graduate School of Arts and Sciences.

254 **Human Ecology** (3)

Ecology—man within the framework of reference—physical and cultural anthropology, geography, sociology, urban planning, public health, and public administration.

256 **Introduction to Environmental Health** (3)

Organizations, functions, current practices, and regulations at all levels to control the environment. Economic impact upon society and industry in carrying out control and preventive practices.

270 **Industrial Hygiene** (3)

Industrial health hazards: chemical exposure to toxic dusts, metallic fumes and vapors, gases, and organic compounds; physical hazards such as high and low temperature biological effects, radiation (electromagnetic, ultraviolet, ionizing), illumination, sound, pressure, and particulate pollution; prevention and control of industrial health hazards.

293 **Public Health and School Health Methods and Activities** (3)

Relationship between public health and school health. The purpose of the course is to aid the teacher in presenting information in the classroom setting.

301 **Applied Epidemiology and Environmental Health** (3)

Lectures, seminars, and case studies. Epidemiological solutions to health problems of the community.

orensic Sciences

nan: C.E. O'Rear, Professor of Forensic Sciences, Samson Hall, Telephone 397 or 676-7319

201 **Forensic Serology I** (3)

Principles of the forensic analysis of blood and other biological materials. Specific procedures and techniques used in forensic serology.

202 **Instrumental Analysis** (3)

Principles and application of various instrumental methods to the examination of criminal evidence, including chromatographic and spectrophometric techniques and mass spectrometry.

203 **Examination of Questioned Documents** (3)

Theory and principles of handwriting and handprinting, duplicating processes, paper manufacture and fiber analysis; studies of paper and methods of examining questioned documents.

204 **Firearms and Tool-mark Identification** (3)

Methods for identifying firearms, cartridge casings, tool-marks, tire marks, and footprints.

205 **Personal Identification** (3)

Methods of personal identification based on sketches, fingerprints, voice prints, odontology and study of skeletal remains.

214 Forensic Psychiatry (3)

Introduction to the constructs of dynamic psychiatry, psychiatric treatment, and the nomenclature of mental disorders. Consideration of expert testimony, direct examination, and cross-examination in hospitalization and criminal cases.

220 Physical Aspects of Forensic Sciences (3)
(Formerly Introduction to Forensic Science)

Survey of forensic physical sciences; fingerprints, firearm and tool-mark examinations, document examinations, and examinations of trace evidence such as glass, soil, paint, hairs and fibers; crime scene investigations, qualifications and preparation of expert witnesses; operation and functioning of the forensic science laboratory.

221 Biological Aspects of Forensic Sciences (3)

Principles of forensic pathology, serology and toxicology. The role of the forensic laboratory in the identification of human remains; determination of the time, cause, and manner of death; partial individualization of biological materials, and the detection of drugs in biological materials.

224 Criminal Law I (3)

Principles of criminal law and procedure, preparation and presentation of evidence, examination of witnesses, and methods of legal research.

225 Criminal Law II: Evidence (3)

Procedural rules affecting the collection and use of physical evidence. Emphasis on court opinions defining the rules of search and seizure and admissibility of evidence. Prerequisite: ForS 224.

227 Criminal Law III: Procedure (3)

Decision to arrest, prosecutive discretion, bail, the preliminary hearing, right to a speedy trial, discovery, plea bargaining, publicity, post-conviction procedures. Prerequisite: ForS 224.

228 Administration of Criminal Justice (3)

Consideration and analysis of selected advanced problems in the administration of criminal justice. Emphasis on the role and professional responsibilities of prosecutor and defense counsel and on developmental trends in the law. Prerequisite: ForS 224.

251 Moot Court (3)

Students will prepare and present direct testimony and be cross examined by an experienced trial attorney in simulated courtroom setting. Class discussions of problems, techniques. Lectures on discovery, admissibility of scientific evidence, chain of custody, use of notes. Prerequisite: ForS 224.

254 Selected Topics in the Forensic Sciences (3)

Current issues in research, investigation, and law.

260 Principles of Forensic Medicine (3)

Anatomy and physiology of the human body with emphasis on understanding the processes underlying traumatic and unexpected deaths encountered in forensic pathology. Bone growth and repair as it relates to child abuse, structure and functions of the heart relating to sudden death, and anatomic area of the brain prone to hemorrhagic lesions following trauma.

261 **Principles of Forensic Pathology** (3)

Terminology and scientific techniques used in medico-legal investigations, sudden or unexpected deaths, homicides, suicides, accidental deaths, and trauma.

265 **Drugs of Abuse** (3)

Chemical, pharmacological, toxicological, and pathological characteristics of commonly abused drugs, including ethanol, barbiturates, narcotics, stimulants, and hallucinogens. Primarily for M.A. in Sp.Std. degree candidates; open to others with permission of instructor.

266 **Seminar: Modern Trends in Criminal Justice** (3)

Recent advances in criminal justice. Discussions incorporate several disciplines including science, law, management, social sciences, and psychology.

269 **Forensic Toxicology I** (3)

Relevant underlying biological, chemical, and pharmacological principles of forensic toxicology.

274 **Management of Criminal Justice Organizations** (3)
(Formerly Forensic Laboratory Management)

Theories of management with emphasis on leadership. Interaction of individuals, groups, managers, and the organization as a whole. Discussions centered on the criminal justice system.

295 **Research** (arr.)

Open to qualified master's degree students. Research on problems approved by the department chairman or academic advisor, under the supervision of an appropriate staff member.

299–300 **Thesis Research** (3–3)

rench*

airman: G.E. Mazzeo, Professor of Romance Languages; Monroe 411, Telephone 76-6330

Placement Examination: A student who has not been granted advanced standing d who wishes to continue in college the language begun in high school must take placement examination before registration. Upon completion of the examination, nment is made to the appropriate course.

1–2 **First-year French** (3–3) (Campus Course)

A year course; credit toward a degree at this University given on completion of Fren 2. For beginners. Pronunciation, conversation, grammar, composition, readings. Oral practice in language laboratory. Laboratory fee, $17.50 per semester.

3–4 **Second-year French** (3–3) (Campus Course)

A year course; credit toward a degree at this University given on completion of Fren 4. Conversation, grammar, composition, reading in modern French prose. Oral practice in language laboratory. Prerequisite: Fren 1–2. Laboratory fee, $17.50 per semester.

*Administered by the Department of Romance Languages and Literatures

Geodesy*

Program Advisor: Hyman Orlin, Professorial Lecturer in Cartography, Geodesy, and Oceanography, Building F, Telephone 676-7000 or 946-3557

12 Plane Surveying (3)

Basic plane surveying for cartographers and surveyors. Field exercises as arranged. Prerequisite: Math 30 or equivalent mathematical experience.

13 Higher Surveying (3)

Elements of geodetic and hydrographic surveying for cartographers and surveyors. Field exercises as arranged. Prerequisite: Geod 12 and Math 32

17 Elementary Photogrammetry (3)

Fundamentals of aerial photography, photogrammetric optics, and photographic processes; mathematics of vertical and tilted photographs; stereoscopy and parallax; planning and executing the photogrammetric project; radial triangulation methods; photomaps; oblique and terrestrial photography. Recommended prerequisite: Geod 12, Math 31.

18 Intermediate Photogrammetry (3)

Basic theory and practices. Stereoscopic plotting instruments; graphical and computational methods for adjusting strips of aerotriangulation. Method of least squares, statistics and transformations applied to photogrammetry. Prerequisite: Geod 17.

106 Physical Science Data Analysis (3)

Elementary analysis of cartographic, geodetic, and oceanographic data. Basic concepts of probability, sample statistics, probability distributions, confidence intervals, estimation and tests of hypotheses as related to cartographic, geodetic, and oceanographic data. Prerequisite: Math 31, and either Cart 1–2 or Geod 150–151.

110 Map Projections (3)

Elementary theory of projections in cartography and geodesy. Projection of the sphere and ellipsoid on plane, conical, and cylindrical surfaces. Prerequisite: Math 33

117 Analytic Photogrammetry (3)

Analytic photogrammetry theory and practice: matrix algebra, method of least squares, image coordinate refinement, formulation for analytic photogrammetry, intersection, linearization of equations, space resection, two- and three-photo relative orientation, strip adjustment review, block adjustment. Prerequisite: Math 32, Geod 18.

119 Advanced Mathematical Photogrammetry (3)

Mathematical treatment of resection, intersection, relative orientation, error propagation, adjustment and coordinate transformation using matrix algebra. Derivation of colinearity equations and image coordinate corrections for frame, panoramic, and strip photography. Prerequisite: Geod 17, Math 124 or equivalent experience

* Affiliated with the Department of Geography and Regional Science

150 Geometric Geodesy (3)

Principles and formulas basic to theoretical and applied geodesy. Primary emphasis on geometric methods. Prerequisite: Math 33.

151 Physical Geodesy (3)

Physical and celestial methods and application of geodesy. Prerequisite: Geod 150, Phys 1 or 3, Math 33.

156 Geodetic Astronomy (3)

Astronomic determination of longitude, time, azimuth, and latitude. Prerequisite: Math 32, Geod 150 or comparable experience.

158 Electronic Surveying and Navigation (3)

An examination of the principles and applications of techniques. Topics include: EM wave propagation, system error identification and analysis, representative surveying systems, baseline radio navigation systems and long line calculations and transformation techniques. Prerequisite: Math 32, Phys 1, Cart 1 or Ocea 11.

160 Adjustment Computations I (3)

Basic adjustment theory. Prerequisite: Geod 106, 150; Math 32, 124 (or equivalent experience).

161 Adjustment Computations II (3)

Topics in advanced adjustment theory. Applications to geodesy and photogrammetry. Prerequisite: Geod 160.

165–66 Space Techniques for Geodesy (3–3)

Determination of the gravitational field, station positions and fundamental physical constants. Basic celestial mechanics, computing techniques and data analysis. Modern data acquisition systems. Prerequisite: Math 33, 124, Geod 150, 151; or equivalent experience.

eography and Regional Science

hairman: M. Gordon, Professor of Geography and Regional Science: I-202. Tele-one 676-6185

51 Introduction to Geography (3)

General survey of the systematic fields of human geography which play a role in the analysis and interpretation of man-environment relationships in both spatial and ecological contexts.

52 Introduction to Economic Geography (3)

Examination of the basic principles which determine the location of economic activities.

127 Population and Settlement (3)

Patterns of world population; factors contributing to population pressures, growth, and migrations.

132 Resource Management and Conservation (3)

Principles and practices in effective utilization of resources in the United States and selected areas; public policies relating to conservation; environmental systems, perception, and impact studies.

133 **Geography of Poverty and Hunger** (3)

Consideration of the locational aspects and correlates of poverty and hunger: rural and urban poverty regions; regional food budgets and taboos; programs concerned with the elimination of poverty and hunger.

141 **Urban Settlement** (3)

The location of cities, urbanization processes, theories and models of urban location and development.

145 **Cultural Geography** (3)

Analysis of the relationships between culture and environment; emphasis on spatial and ecological considerations.

146 **Political Geography** (3)

Interrelationships among the human and physical environment and political systems; the organization of political territories.

148 **Principles of Geography** (3)

Study of geographic principles, technology and tools designed to meet specific needs of teachers. Emphasis on the practical application of geographic concepts and the use of source materials in the classroom.

155 **Middle East** (3)

Survey of the cultural and physical regional patterns of the Middle East.

161 **Latin America** (3)

Examination of spatial characteristics of physical and cultural phenomena in Middle and South America.

208 **New Perspectives in Geography** (3)

An overview of recent trends in geographic research. Selected topics include diffusion processes, spatial behavior, locational analysis, and environmental perception.

224 **Seminar: Political Geography** (3)

Examination of the political factor in location theory and analysis of the nature of political territories.

243 **Seminar: Urban Geography** (3)

Functional processes affecting the evolving morphology and internal spatial patterns of urban phenomena; emphasis on economic factors, behavioral considerations, and impact of time.

Geology

Chairman: F.R. Siegel, Professor of Geochemistry; Bell 102, Telephone 676-6190

1–2 **Introductory Geology for Nonscience Majors** (3–3) (Campus Course)

An introduction, for nonscience majors, to the principal features of the the composition, structure, and history of the earth. Topics include nature of minerals and rocks, physical processes, energy resources, continental drift, origin of life, and evolution. Lecture (2 hours), laboratory (2 hours). Laboratory fee, $15.

3 **Introductory Geology for Nonscience Majors** (3)

Nonlaboratory course for off-campus students only. Survey covering the principles of geology.

4 **Introductory Geology for Nonscience Majors** (3)

Geological periods, evolution of life on earth. Nonlaboratory course for off-campus students only. Prerequisite: Geol 1 or 3, or permission of instructor.

5 **Environmental Geology** (3) (Campus Course)

The relation of people and society to natural environments; population evolution and mineral resources; economic, legal, and political aspects. Laboratory fee, $15.

14 **Mineralogy and Petrology for Nonscience Majors** (3) (Campus Course)

Lectures and laboratory. Prerequisite: Geol 1-2 or permission of instructor.

105 **Geological Hazards in Land-Use Planning** (3) (Campus Course)

An analysis of geological hazards and related factors that affect land-use planning. Field trip. Prerequisite: Geol 5 or 21, or permission of instructor. Laboratory fee, $10.

125 **Marine Geology** (3) (Campus Course)

Lecture and map work. Principles of oceanography and submarine geology; topography, crustal structure, sedimentary processes, and marine environment. Prerequisite: Geol 1–2 or 21–22; or permission of instructor.

141 **Introductory Geochemistry** (3) (Campus Course)

Principles and theories on the abundance, relationships, and distribution of the elements in various rock and mineral species. Prerequisite or concurrent registration: Geol 117 or equivalent; Chem 11–12; Math 30; Phys 1 or 3; or permission of instructor. Laboratory fee, $5.

175 **Hydrogeology** (3) (Campus Course)

The occurrence, storage, movement, quality, and problems of pollution of subsurface water, and the hydrologic properties of water-bearing materials. Prerequisite: Geol 111, 122; Math 31; Chem 11–12; or permission of instructor.

ermanic Languages and Literatures

hairman: C. Steiner, Professor of German; Rice 408, Telephone 676-6195

Placement Examination: A student who has not been granted advanced standi and who wishes to continue in college the language begun in high school must ke a placement examination before registration. Upon completion of the examiation, assignment is made to the appropriate course.

1–2 **First-year German** (3–3) (Campus Course)

Fundamental concepts of German culture; essentials of German structure and basic vocabulary; reading of easy prose and conversation. Aural-oral practice in language laboratory. Laboratory fee, $17.50 per semester. Prerequisite to Ger 2: Ger 1.

3–4 **Second-year German** (3–3) (Campus Course)

Introduction to German civilization; selections from modern German prose; continuation and review of German structure; conversation and

simple composition. Aural-oral practice in language laboratory. Prerequisite to Ger 3: Ger 1–2 or equivalent. Prerequisite to Ger 4: Ger 3. Laboratory fee, $17.50 per semester.

Hebrew*

Chairman: J.E. Ziolkowski, Associate Professor of Classics; T-204. Telephone 676-6125

Placement Examination: A student who has not been granted advanced standing and who wishes to continue in college the language begun in high school must take a placement examination before registration. Upon completion of the examination, assignment is made to the appropriate course.

21–22 **Beginning Hebrew** (3-3) (Campus Course)

Grammatical essentials of the language; readings selected from classical and modern texts; basic audio-lingual drills for comprehension and expression. Laboratory fee, $17.50 per semester.

23–24 **Intermediate Hebrew** (3-3) (Campus Course)

Intensive readings and text analysis, with opportunities to develop basic skills. Materials range from Israeli newspapers and scholarly journals to liturgical poetry and rabbinic narratives. Laboratory fee, $17.50 per semester.

History

Chairman: Lois G. Schwoerer, Professor of History; Lisner 503-I. Telephone 676-6796

Course Accessibility: All second-group courses are open to students without history course prerequisites.

39–40 **European Civilization in Its World Context** (3-3)

Hist 39: political, social, economic, and cultural history to early modern era. Hist 40: from early modern era to present.

71–72 **Introduction to American History** (3-3)

Hist 71: political, social, economic, and cultural forces of the United States in their world setting from the beginning to 1876. Hist 72: from 1876 to present.

131-32 **History of Germany** (3–3)

Political, social, and cultural development. Hist 131: from mid-17th century to Bismark. Hist 132: from William II to the present.

145 **Imperial Russia** (3)

From the reign of Peter the Great to World War I.

146 **Soviet Russia** (3)

The Russian Revolution and Soviet rule to the present.

* Administered by the Department of Classics

149–50 **European Diplomatic History** (3–3)

Emphasis on policies and actions of the great powers and their statesmen. Issues of war and peace, international crises, nationalism, alliances, and tensions. Hist 149: 1812 to 1890. Hist 150: since 1890. Students who receive credit for Hist 150 cannot receive credit for Hist 157 *20th-century European Diplomatic History*.

163–64 **History of Latin America** (3–3)

Hist 163: analysis of Spanish and Portuguese imperialism in the New World, 1492-1820. Hist 164: a problems approach to Latin America, 1820 to the present; thematic emphasis on neo-colonialism, corporatism, liberalism, caudilloism, modernization, populism, and revolution.

171–72 **U.S. Social History** (3-3)

Hist 171: daily life, institutions, intellectual and artistic achievements of the agrarian era, 1607-1861. Hist 172: the urban-industrial era from 1861 to present.

181–82 **U.S. Diplomatic History** (3–3)

American foreign relations from the era of the American Revolution. Hist 181: to 1898. Hist 182: 20th century.

195 **Traditional Civilizations of China and Japan** (3)
(Formerly History of East Asia)

Intellectual, institutional, and social development of the traditional civilizations of China and Japan from their origins to 1800.

196 **The Modern Transformation of China and Japan** (3)
(Formerly History of East Asia)

The social, political, and intellectual transformation of China and Japan from the mid-19th century to the present.

201 **History and Historians** (3)

Historiography and historical method for graduate students. Readings and discussions on major trends in history; selections from classics of historical literature. Students who receive credit for Hist 201 cannot receive credit for Hist 199 *Proseminar: Readings for the History Major*.

uman Kinetics and Leisure Studies

hairman: J.L. Breen, Professor of Human Kinetics and Leisure Studies; K-201, elephone 676-6280

101 **Physical Education and Sports in Human Resource Centers** (3)

Development of physical education and sports programs in schools and play settings. Includes philosophy and curriculum.

104 **Introduction to Travel and Tourism** (3)

Survey of the travel and tourism industry with emphasis on the travel agency, marketing tourism and travel, research and development of tourist destinations, and the economic and social impact of tourism.

105 **Introduction to Adaptive Physical Education and Therapeutic Recreation** (3)

Philosophy, methods, and concepts relating to recreation and adaptive physical education for the ill, aged, and disabled. Concepts in program

planning, leadership, and adaptations of activities to special groups. Includes field visitation and analysis of activities.

117 **Dance Education** (3)

Organizational, methodological, philosophical and conceptual approaches to the teaching of dance in academic and nonacademic settings. Prerequisite: HKLS 157 *Dance Technique Theory*.

119 **Creative Dance for Children** (3)

Dance as an expressive art medium for children; concepts, principles, methods, and materials. Emphasis given to dance in elementary education with consideration for special education.

129 **Introduction to Motor Learning** (3)

Concepts of motor skill learning applied to the teaching of movement skills.

135–36 **Dance History** (3-3)

Study of dance from antiquity to present; emphasis on cultural significance of dance as art, education, and social behavior.

184 **Workshop** (1 to 3)

May be repeated for credit with permission of advisor.

202 **Conceptual Basis of Motor Learning** (3)

Variables of perceptual motor learning and performance; theories, concepts, and models of learning related to the development of motor skills.

205 **Perceptual-Motor Programs: Diagnostic Therapeutic Techniques** (3)

Programs of perceptual-motor therapy and their basic assumptions and diagnostic-therapeutic techniques.

232 **Current Issues in Elementary School Physical Education** (3)

Current philosophy, trends, and research; implications for curriculum, instruction, evaluation.

239 **Administration of Recreation and Tourism Services for Special Populations** (3)

(Formerly Urban Recreation for Special Populations)

Development of recreation and tourism opportunities for disabled, elderly, and other special populations; emphasis on administrative competencies in community organization, communications, consultation, program development, evaluation, and fiscal management.

240 **Physical Education for the Handicapped** (3)

Adaptive physical education for handicapped populations; development of competencies in diagnostic-prescriptive teaching, program design and evaluation, consultation, and communications.

244 **Therapeutic Recreation Practice** (3)

Professional competencies for delivery of therapeutic recreation services to handicapped populations in clinically oriented settings. Emphasis on client assessment, activity analysis, treatment programming and relationship of therapeutic recreation to total rehabilitation goals.

250 **Administration of Travel and Tourism Services** (3)

Organization and management of a comprehensive system of tourism services utilizing educational, cultural, and recreational resources; emphasis on public relations, personnel administration and supervision, cost-benefit analysis, fiscal management and managerial accountability.

270 **Philosophic Foundations of Dance** (3)

Examination and discussion of aesthetic theories in the arts and dance as a performing art, with application to criticism.

276 **Dance in Society** (3)

Anthropological aspects of dance; emphasis on current research and literature.

280 **Advanced Workshop** (1 to 3)

Workshops with emphasis on contemporary issues and problems; development of advanced professional competencies. May be repeated for credit with permission of advisor.

283 **Practicum** (3 to 6)

Field work, internship and or instructional practice, including conference and/or seminar. May be repeated once for credit with permission of advisor.

lian*

rman: G.E. Mazzeo, Professor of Romance Languages; Monroe 411, Telephone 9330

lacement Examination: A student who has not been granted advanced standing who wishes to continue in college the language begun in high school must take a ment examination before registration. Upon completion of the examination, asnent is made to the appropriate course.

1–2 **First-year Italian** (3–3) (Campus Course)

A year course; credit toward a degree at this University given on completion of Ital 2. For beginners. Pronunciation, conversation, grammar, composition, readings. Oral practice in language laboratory. Laboratory fee, $17.50 per semester.

3–4 **Second-year Italian** (3–3) (Campus Course)

A year course; credit toward a degree at this University given on completion of Ital 4. Conversation, grammar review, composition, reading of modern Italian prose, introduction to Italian civilization. Oral practice in language laboratory. Prerequisite: Ital 1–2. Laboratory fee, $17.50 per semester.

*inistered by the Department of Romance Languages and Literatures.

Journalism

Chairman: Philip Robbins, Associate Professor of Journalism; Stuart 301, Telephone 676–6225

116 **Magazine Layout and Design** (3)

Layout, typography, and design for magazines, newsletters, house organs, and similar publications for associations, institutions, and industry.

145 **Principles and Problems of Public Relations** (3)

Principles, problems, and ethics of public relations for government agencies, commercial establishments, educational and other public institutions. Case histories of successful programs.

Management Science

Chairman: J.F. McCarthy, Jr., Associate Professor of Business Administration; Building G207, Telephone 676-7089

118 **Introduction to Information Processing** (3)

Basic principles, terminology, and methods of computer data processing. Introduction to the use of the computer as a tool through assignments illustrating typical problems encountered in business and government data processing. Assignments involve flow charting and computer programming in a higher-level language (FORTRAN) and are run on the SGBA computer with the School's computer terminals. Laboratory fee, $25 (applicable to off-campus locations having access to the University and SGBA computer centers).

119 **Computer Programming for Information Systems** (3)

COBOL programming for business and government data processing applications. For students already familiar with basic computer concepts, flow charting, and programming. Emphasis on practical computer applications in accounting and management information systems. Prerequisite: Mgt 118 or Stat 97. Laboratory fee, $25 (applicable to off-campus locations having access to the University and SGBA computer centers).

Mathematics

Chairman: T.P.G. Liverman, Professor of Mathematics; Library 719J, Telephone 676-6235

No Mathematics courses numbered 1 to 100 are available for college credit if the student's previous training in mathematics meets the prerequisite for a higher numbered course.

Graduate credit may not be given for Mathematics courses numbered from 101 to 200 without the permission of the Chairman of the Department.

3 **College Algebra** (3)

Equivalent to the standard two years of high school algebra with several additional topics. Prerequisite: one year each of high school algebra and high school geometry.

6 Plane Trigonometry (3)

Prerequisite: two years of high school algebra and one year of high school geometry, or Math 3 (or concurrent registration therefor).

9 General Mathematics I (3)

For students electing Math 9 and 10 as a terminal sequence. Logic, sets, Euclidean and non-Euclidean geometries. Algebra; calculus. Prerequisite: two years of high school mathematics.

10 General Mathematics II (3)

Probability and statistics. The computer. Modern mathematical systems; applications to the social sciences and humanities. Prerequisite: Math 9.

30 Precalculus (3)

Set theory, inequalities, basic analytic geometry, functions and relations. Polynomial, trigonometric, logarithmic, and exponential functions. Prerequisite: Math 3 and 6; or one and one-half years of high school algebra, one year of high school geometry and one-half year of high school trigonometry; or equivalent. Prior to registration, new students must take a placement examination in algebra and trigonometry.

***31 Single Variable Calculus I (3)**

(Formerly Calculus of One Variable)

Differentiation and integration of algebraic functions, exponentials and logarithms with simple applications. Analytic geometry. Prerequisite: Math 30 or equivalent.†

32 Single Variable Calculus II (3)

(Formerly Calculus of Several Variables)

Calculus of trigonometric functions. Techniques of integration. Infinite series; vectors; 3-dimensional analytic geometry. Prerequisite: Math 31.

33 Multivariable Calculus (3)

(Formerly Calculus of Vector Functions)

Vector-valued functions. Partial differentiation. Multiple integrals. Topics in vector calculus. Prerequisite: Math 32.

***41 Calculus for Economists I (4)**

Differentiation and integration of algebraic and elementary transcendental functions; marginal analysis for functions of one variable; optimization of one variable applied to economics. Prerequisite: Math 30 or equivalent.†

42 Calculus for Economists II (4)

Elementary linear algebra with economics applications, including input-output models; partial derivatives; multiple integrals; marginal analysis for functions of several variables; optimization of functions of several variables applied to economics; infinite series. Prerequisite: Math 41.

e School of Government and Business Administration does not accept credit for this course d the B.B.A

h 30 may be waived as a prerequisite by examination on scheduled dates.

*51 **Mathematics for the Social and Management Sciences I** (3)

Notion of function, graph of function; sequences; differential calculus of functions of one variable; exponential and logarithmic functions. New students must take a placement examination in algebra prior to registration.

*52 **Mathematics for the Social and Management Sciences II** (3)

Integral calculus of functions of one variable; functions of several variables; partial derivatives, maxima and minima, Lagrange multipliers; systems of linear equations and inequalities; matrix algebra, determinants, rudiments of linear programming. Prerequisite: Math 51.

111 **Mathematics for Engineers and Physicists I** (3)

Differential equations, Laplace transform. Series solutions of differential equations. Boundary value problems. Prerequisite: Math 33.

112 **Mathematics for Engineers and Physicists II** (3)

Vector analysis. First- and second-order partial differential equations. Topics in complex variables. Prerequisite: Math 111.

124 **Introduction to Matrix Theory** (3)

Operations on matrices, linear equations, matrix inversion, vector spaces, characteristic roots and vectors, Hamilton-Cayley Theorem. Systems of linear difference and differential equations. Quadratic forms. Applications to economic, biological, and physical models. Prerequisite: Math 32 or permission of instructor.

134 **Introduction to Boundary-value Problems** (3)

Prerequisite: Math 111 or 142, *Theory of Differential Equations.*

139 **Advanced Calculus I** (3)

Topology of R^n. Continuous mappings. Uniform convergence. Differentiable mappings. Prerequisite: Math 33.

140 **Advanced Calculus II** (3)

Contraction maps, implicit function and differential equation theorems. Integration theory. Fourier series. Prerequisite: Math 139 or equivalent.

153 **Introduction to Numerical Analysis** (3)

Introduction to fundamentals of numerical analysis using modern digital computers. Solution of linear systems and of ordinary differential equations. Interpolation polynomials. Iterative solution of nonlinear equations. Simple quadrature techniques. Prerequisite: Math 33 or equivalent.

Music

Chairman: George Steiner, Professor of Music; S-102, Telephone 676-6425

3 **Introduction to Musical Understanding** (3)

Introductory history of musical styles, related to listening; study of music materials and media.

* Social and management science students with a strong record in high school mathematics are advised to take Math 31, 32, and 124 instead of Math 51 and 52.

4 Survey of Music Literature (3)

Introductory study of musical forms, structures, and textures; aural analysis of selected literature.

eanography*

ram Advisor: Hyman Orlin, Professorial Lecturer in Cartography, Geodesy, and anography, Building F, Telephone 676-7000 or 946-3557

11 Navigation (3)

Theory of navigation, charts, navigation aids, celestial navigation, shipboard instruments. Prerequisite: college algebra, trigonometry, and Engl 10.

101 Oceanography for Science Majors I (3)

Chemical and physical properties of the oceans; composition of seawater, heat budget, distribution of variables, statics, dynamics, water masses, general circulation of the oceans, underwater sound, and propagation of light. Laboratory and field trips as arranged. Prerequisite or concurrent registration: Math 31, Phys 1 or 3.

102 Oceanography for Science Majors II (3)

Physiography and characteristics of the sea floor, ocean basins and margins. Marine biology and ecology. Laboratory and field trips as arranged. Prerequisite or concurrent registration: Geol 1, 3, or 21; BiSc 11.

103–4 General Oceanography (3–3)

Ocea 103: general circulation of the oceans; waves, tides, and properties of sea water; history and methods. Ocea 104: topography and sediments of the ocean floor; life in the sea; and interrelationships of the marine sciences. Field trips as arranged. Courses may be taken independently.

105 Elementary Geophysics (3)

Gravity geomagnetism, and seismology in cartography, geodesy, and oceanography. Prerequisite: Math 32, Phys 1 or 3

106 Physical Science Data Analysis (3)

Elementary analysis of cartographic, geodetic, and oceanographic data. Basic concepts of probability, sample statistics, probability distributions, confidence intervals, estimation and tests of hypotheses as related to cartographic, geodetic, and oceanographic data. Prerequisite: Math 31, Ocea 101–102.

107 Introduction to Meteorology (3)

An introduction to meteorology including synoptic meteorology, weather forecasting, general circulation of the atmosphere, and air pollution. Prerequisite: Math 30.

110 Physical Oceanography (3)

Physical properties of sea water, underwater sound, and propagation of light. Currents, heat budget, turbulence, and the general circulation and

liated with the Department of Geography and Regional Science.

water masses of oceans. Laboratory and field trips as arranged. Prerequisite: Math 32, Ocea 101, Phys 1 or 3.

111 **Ocean Waves and Tides** (3)

Basic tidal theory; wind waves, seiche, storm surge, and tsunami; analyses and principles of prediction. Field trips as arranged. Prerequisite: Math 32, Ocea 101.

112 **Biological Oceanography** (3)

The study of life in the sea. Biogeography, description, systematics, characteristics of ecology of marine animal and plant groups. Primary productivity and organic food cycles. Biological sampling procedures. Bioluminescence. Symbiotic relationships. Biodeterioration processes and pollution problems. Laboratory and field trips as arranged. Prerequisite: Ocea 102, BiSc 11.

113 **Marine Geophysics** (3)

Principles of marine geophysical measurements and interpretation. Prerequisite: Ocea 105, Phys 1 or 3.

114 **Chemical Oceanography** (3)

Chemical processes in the marine environment, including composition of sea water, nutrients, natural composition and variation, carbonate cycle, and extraction. Prerequisite: Chem 12, Ocea 101.

115 **Geological Oceanography** (3)

Physiography of the sea floor and processes active in ocean basins and margins. Laboratory and field trips as arranged. Prerequisite: Ocea 102, 105, Geol 1 or 3 or 21.

120 **Coastal Ecology** (3)

Coastal ecosystems and how they function; the impact of man's activities. Impact of specific topical activities. Prerequisite: Ocea 101, 102, or 103-4

122 **The United States and the Oceans** (3)

Tracing the nation's involvements in marine affairs; the effect upon domestic policy regarding alternative ocean uses.

124 **Introduction to the Law of the Sea** (3)

The changing role of the oceans in international relations: marine activities and ocean law, evolution of the law of the sea since 1960, analysis of major categories of ocean use.

130 **Fisheries Biology and Management** (3)

Examination of ocean and fresh water yields; emphasis on effect on populations fished, maximum and optimum yields, and how, for whom, and for what purpose fisheries are regulated.

132 **Environmental Influences on Marine Living Resources** (3)

The relations between living marine resources and the environment. Climate conditions which determine oceanic conditions. The effect of fluctuations in environmental conditions on distribution and/or abundance of resource species. Prerequisite: Ocea 101, 102 or Ocea 103-4 or equivalent experience.

135 **Oceanographic Instrumentation** (3)

Techniques and problems in making oceanographic measurements. Various sensors are discussed with respect to their characteristics, design and appli-

cation. Ocean engineering related to measurement techniques are discussed. Prerequisite: Ocea 101–102, 105, Phys 1 or equivalent experience.

Oral Biology

Program Advisor: E.A. Caress, Assistant Dean of the Graduate School of Arts and Sciences; Bacon 201, Telephone 676-6210

The courses listed below are open only to students in the program of study leading to the degree of Master of Science in Special Studies with a concentration in Oral Biology. This degree program is offered by the Graduate School of Arts and Sciences in cooperation with the Army Institute of Dental Research at the Walter Reed Army Medical Center (see page 74).

207 **Physical Diagnosis** (1)

208 **Biochemistry** (1)

209 **Pharmacology** (1)

210 **Microbiology** (2)

211 **Biostatistics and Research Methodology I** (2)

212 **Biostatistics and Research Methodology II** (1)

213 **Oral Pathology I** (2)

214 **Oral Pathology II** (2)

215 **Human Anatomy** (1)

216 **Dental Materials** (1)

218 **Perspectives in Clinical Human Nutrition** (1)

Pharmacology

Chairman: H.G. Mandel, Professor of Pharmacology; Ross 640, Telephone 676-6541

115 **Nonmedical Use of Licit and Illicit Drugs** (3)
(Formerly Drug Abuse Education)

Psychological and sociological bases of recreational and other nonmedical use of drugs, pharmacological and toxicological aspects of drug action on both the brain and peripheral organ systems, legal and societal implications of and reactions to the nonmedical use of drugs, prevention and treatment of drug dependence. Lectures and discussions on alcohol, narcotics, central nervous system stimulants and depressants, marijuana, hallucinogenic and psychedelic drugs. No science prerequisites.

215 **Adolescent Drug Abuse** (3)

Primarily for teachers, counselors, and school administrators. Multidisciplinary lectures and discussions concerning the physiological and psychological effects of narcotics, central nervous system stimulants and depressants, alcohol, and hallucinogenic and psychedelic drugs; psychosocial factors leading to adolescent drug abuse; legal implications of drug abuse; prevention, control, and treatment of drug abuse.

Philosophy

Chairman: R.H. Schlagel, Professor of Philosophy; Rice 611, Telephone 676-6266

45 **Introduction to Logic** (3)

Deduction, induction, and legal reasoning; emphasis on recognition of fallacies and practical applications of logic.

50 **Introduction to Philosophy** (3)

Readings from major philosophers and study of philosophic positions from Plato to Sartre.

133 **Philosophy, Nonviolence, and the Problem of War** (3)

Problems of war in relation to morality; theories of human aggression and violence; nonviolence and pacificism as alternatives to war; doctrine of just war.

Physics

Chairman: N.K. Khatcheressian, Associate Professor of Physics; Corcoran 103, Telephone 676-6275

ASTRONOMY

9–10 **Introduction to Astronomy** (3–3) (Campus Course)

Lecture (2 hours), recitation (1 hour), laboratory (2 hours). Classical through modern astronomy with introduction to basic principles underlying astronomical systems and observations. Primarily for nonscience majors. Laboratory fee, $11 a semester.

PHYSICS

1 **Foundations of Physics** (4) (Campus Course)

Lecture (2 hours), recitation (1 hour), laboratory (2½ hours). Development of conceptual principles underlying modern physical knowledge; basics of mechanics, heat, and light, including the classical concepts of energy, momentum, heat, temperature, entropy, and optics. Prerequisite: two years of college preparatory mathematics or concurrent registration in Math 6. Laboratory fee, $18.

2 **Introduction to Modern Physics** (4) (Campus Course)

Topics focusing upon present understanding of the physical universe and character of the atomic and subatomic worlds. Includes considerations of electric and magnetic phenomena, relativity theory, wave-particle duality, quantum theory, nuclei, and subnuclear particles. Prerequisite: Phys 1 or equivalent. Laboratory fee, $18.

3 **Foundations of Physics** (3)

Same as Phys 1 without laboratory. May not be taken for credit by students who are enrolled in Phys 1 for credit.

4 **Introduction to Modern Physics** (3)

Same as Phys 2 without laboratory. May not be taken for credit by students who are enrolled in Phys 2 for credit.

Political Science

Chairman: B. Reich, Professor of Political Science and International Affairs; C–625, Telephone 676-6290

Departmental prerequisite: PSc 1 and 2 (or their equivalent) are prerequisite to all second-group courses in political science.

1 **Introduction to Comparative and International Politics** (3)
Comparative and international political systems; emphasis on structures and processes of major foreign governments and the force of basic ideologies.

2 **Introduction to American Politics and Government** (3)
Structure, powers, and processes of the American political system.

3 **Introduction to Political Behavior** (3) (Campus Course)
Study of political behavior, including the role of politics in today's world, the sources of elite and mass political behavior, and the influence and nature of political institutions.

104 **Methods of Public Policy Analysis** (3)
Models and case studies of public policy formation and changes, techniques of policy analysis and evaluation, normative implications of alternative policy-making frameworks.

105 **Political Theory: Major Issues of Western Political Thought I** (3)
Foundations of Western political thought—Plato to Aquinas.

106 **Political Theory: Major Issues of Western Political Thought II** (3)
Theoretical roots of modern political order and disorder—Machiavelli to Rousseau.

110 **American Political Thought** (3)
Political thought in the U.S. from colonial times to the present as seen through major representative writings.

111 **State and Urban Politics** (3)
Comparative analysis of context, institutions, processes, and policies of state and urban political systems.

112 **State and Urban Policy Problems** (3)
Selected issues in state and urban policy-making, with emphasis on urban and metropolitan settings.

114 **U.S. Constitutional Law and Politics I** (3)
Separation of powers, federal-state relationships, economic regulation.

115 **U.S. Constitutional Law and Politics II** (3)
Political and civil rights.

116 **The American Presidency** (3)
Examination of the politics of presidential selection, the authority of the contemporary institution, the mechanisms and processes for formulating public policy, and the influences of personality on performance.

117 Public Administration and Bureaucratic Politics (3)

Basic concepts in public administration; influence of bureaucratic politics on policy formulation and implementation.

118 Legislative Process (3)

Study of Congress, including theories of representation, legislative power structure, selection of legislators and the roles they play, decision-making, and the relationship between the legislative and executive branches.

119 U.S. Political Parties and Politics (3)

Role of parties as a linkage between mass preferences and government policies. Organization, nominations, voting, and activities in legislative and executive branches.

122 Science, Technology, and Politics (3)

Multiple impacts of scientific and technological developments on the political systems. Discussion of public policies for support, use, and control of science and technology.

130 Comparative Government and Politics I (3)

Comparative political analysis with primary focus on the principal states of Western Europe.

131 Comparative Government and Politics II (3)

Government and politics of the communist nations; emphasis on the Soviet Union and countries of Eastern Europe.

140 International Politics (3)

International actors, international and domestic environments of foreign policy, global and regional patterns, general characteristics of foreign policy.

142 International Organizations (3)

Development and operations of the United Nations, regional organizations, and functional international organizations.

144 Public International Law (3)

Survey of international law; emphasis on development and trends.

146 U. S. Foreign Policy (3)

Constitutional, political, and international factors that determine the formulation, execution, and substance of U.S. foreign policy.

170 Governments and Politics of China and Japan (3)

Political institutions and processes of China since 1949 and of Japan since 1945. Influence of indigenous traditions and foreign contacts.

173 Governments and Politics of South and Southeast Asia (3)

Domestic and international politics of the area's major states.

177 Governments and Politics of the Middle East (3)

Politics of the eastern Arab states, Turkey, Iran, Israel.

178 International Relations of the Middle East (3)

Analysis of the regional and international relations of the Middle East.

180 **Governments and Politics of North Africa** (3)

Domestic and international politics of Algeria, Tunisia, Morocco, Libya, Egypt, Sudan; their relations with states of the Middle East.

181 **Politics of Middle and Southern Africa** (3)

Comparative analysis of political systems in selected countries of non-Mediterranean Africa.

203 **Public Policy Analysis** (3)

Reading and research on systematic methods of public policy analysis.

204 **Methods of Legislative Research** (3)

The process of empirical research: construction of research design, data collection, and analysis. Techniques discussed will include content analysis, survey research, and analysis of institutional voting.

212 **Urban Politics** (3)

The socioeconomic, demographic, and cultural context of urban politics; informal patterns of power and influence in urban decision-making; formal institutions and policy-making processes; urban policies and their impacts.

215 **Judicial Policy-making** (3)

Role of the judiciary in policy formulation; emphasis on the U.S. Supreme Court and civil liberties issues.

216 **American Presidency** (3)

Personalized and institutionalized aspects of the presidency with particular emphasis on the politics of legislative policy-making.

218 **Legislative Theory and Behavior** (3)

Organization, behavior, and policy outputs of the U.S. Congress.

219 **American Political Parties and Electoral Behavior** (3)

Nature and functions of political parties, with special emphasis on party influences on electoral behavior and congressional decision-making.

220 **Public Opinion and Political Socialization** (3)

Sources and dynamics of public opinion and political socialization.

222 **Government, Science, and Technology** (3)

National and international policy issues which arise from the interaction between scientific and technological development and governmental activity.

223 **Science, Technology, and Public Affairs** (3)

Selected public policy issues with significant scientific or technological aspects.

224 **Domestic Policy Analysis—Selected Topics** (3)

Analysis of U.S. policy toward selected domestic problems.

225 **Economic Policy Analysis—Selected Topics** (3)

Analysis of selected topics in U.S. monetary and fiscal policy.

226 **Legislative Elements in Economic Policy Development** (3)
Economic analysis of selected legislative issues and the effect of various economic pressures on policy outcomes.

230 **Comparative Government and Politics I** (3)
Examination of basic approaches to comparative politics.

231 **Comparative Government and Politics II** (3)
Comprehensive examination of specific issue areas in comparative political analysis.

234 **Comparative Legislative Systems** (3)
Selected problems of legislative theory and behavior from a comparative perspective with particular reference to the parliamentary systems of West Germany, France, and Britain.

246 **U.S. Foreign Policy** (3)
Research and selected reading as the basis for analysis of U.S. foreign policy. Particular reference to the decision-making process and policy execution.

249 **U.S. National Security Policy** (3)
Fundamental considerations; selected issues, e.g., arms control and disarmament, regional security problems, military assistance.

250 **Foreign Policy Analysis—Selected Topics** (3)
Analysis of U.S. foreign policy toward selected world regions.

269 **Soviet Military Policy and Strategy** (3)
Soviet developments in military policy and strategy with attention to intra-bloc military cooperation, political context of Soviet military policy, significant changes in recent Soviet military thought.

286 **Selected Topics in American Politics** (3)
Readings and discussion.

Portuguese*

Chairman: G.E. Mazzeo, Professor of Romance Languages; Monroe 411, Telephone 676-6330

Placement Examination: A student who has not been granted advanced standing and who wishes to continue in college the language begun in high school must take a placement examination before registration. Upon completion of the examination, assignment is made to the appropriate course.

31–32 **Intensive Portuguese** (3–3) (Campus Course)
Prerequisite: knowledge of one other Romance language.

* Administered by the Department of Romance Languages and Literatures.

ychology

airman: J.N. Mosél, Professor of Psychology; GG-202. Telephone 676-6320

Departmental prerequisite: Psyc 1, 5, or 6 is prerequisite to all other courses psychology. The departmental prerequisite may be waived with the permission the instructor.

1 **General Psychology** (3)

Fundamental principles underlying human behavior.

8 **Psychology of Motivation and Personality** (3)

Introduction to the psychology of personality. Principles of motivation, personality development, social and cultural factors, and assessment and description of personality emphasized.

22 **Introduction to Educational Psychology** (3)

The contributions of psychology to education; emphasis on learning.

25 **The Theory and Practice of Counseling Special Populations** (6)

The organic and behavioral bases for abuse of alcohol and drugs. Special focus on medical, psychological, and psychiatric issues. Social, economic, political, and legal systems in relation to abuse and the psychological techniques for helping the abuser develop independence from the habit. A synthesis of modern counseling techniques will be emphasized.

29 **Psychology of Childhood** (3)

Developmental approach to study of the child. Emphasis on the socialization process, learning, and the child's view of the world.

101 **Abnormal Psychology** (3)

Causes, diagnosis, treatment, and theories of various types of maladjustments and mental disorders.

112 **Psychology of Adolescence** (3)

Psychological characteristics and problems peculiar to adolescence, with emphasis on application of psychology to the solution of such problems.

121 **Psychology of Learning** (3)

Theories and issues related to basic learning processes as determinants of behavior. Emphasis on current research using both human and animal subjects.

129 **Theories of Personality** (3)

Survey of personality theories; emphasis on their application to problems of individuals.

131 **Psychological Tests** (3)

Survey of psychological tests and their more common uses in business, industry, government, law, medicine, and education. Material fee, $7.

144 **Personnel and Industrial Psychology** (3)

Psychological concepts and methods applied to problems of personnel management, human engineering, employee motivation and productivity.

145 **Psychology of Management** (3)

Psychological aspects of managing work organizations. Departmental prerequisite waived.

146 **Psychotechnology of Learning and Training** (3)

Psychological principles, concepts, and techniques of human learning and behavior modification as applied to the design and operation of training and development systems. Given only as the final course in the Human Systems Building Program.

150 **Psychology of Sex Differences** (3)

Relevant biological, psychological, and sociological influences on males and females in the development of sex differences; hormonal differences, gender identity, differential socialization of sons and daughters, masculinity/femininity, cultural evaluation of male and female roles. Survey of relevant psychological theory. Emphasis on empirical research and hypothesis testing.

151 **Social Psychology** (3)

Social foundations of attitudes and behavior: cognition, motivation, role-behavior, communication, small-group processes, racial attitudes, nationalism and war.

156 **Psychology of Attitudes and Public Opinion** (3)

Psychology of opinion formation, measurement of opinion, social determinants of attitudes, psychological processes in propaganda, bases of receptivity to propaganda, psychological warfare.

175 **Career Development in Youth and Maturity** (3)

Emphasis on the development of long-range career objectives based on review of experiences, the results of psychological testing, seminar discussion groups, and guided independent study. Analysis and practice of the specific skills needed to negotiate for advancement or to accomplish a career change.

191 **Independent Research in Psychology** (3) (Campus Course)

Opportunity for work on individual library or experimental projects. Open to qualified students by permission; arrangements must be made with the sponsoring faculty member prior to registration. May be repeated once for credit.

211 **Assessment of Cognitive Functioning** (3)

Concepts of intelligence and achievement and their assessment through a variety of individual procedures. Material fee, $7. Admission by permission of instructor.

245 **Seminar: Organizational Behavior** (3)

Analysis of organizational behavior; emphasis on motivation and productivity. Recent research on employee attitudes, primary group, supervisory leadership, formal and informal organization, job design.

246 **Seminar: Personnel Evaluation Techniques** (3)

Techniques of personnel selection and performance evaluation. Employment tests, personal data, assessment interviews, performance ratings, and assessment centers. Consideration of federal guidelines in employee selection. Includes practicum.

ligion

rman: H.E. Yeide, Jr., Professor of Religion; O-102A, Telephone 676-6325

9 **The Hebrew Scriptures** (3)

Historical and literary study of the Hebrew Scriptures (Old Testament) with consideration of development of religious ideas, institutions, and outstanding personalities.

10 **The New Testament** (3)

Study of New Testament literature from the standpoint of occasion, purpose, dominant ideas, and permanent values. Emphasis on approach, structure, and significance of the Gospels and Epistles.

21 **Religion and Man's Search for Meaning** (3)

Traditional religious concepts, language of contemporary religion amidst modern scientific and secular intellectual tendencies, and the place of religion in today's society.

22 **Religion and Contemporary Social Issues** (3)

Illumination of social problems by ethical reflection; examination of ethical perspectives as stimuli and barriers to social change; techniques for maintaining social values and seeking change.

59 **Religions of the East** (3)

Origins, evolution, and contemporary status in historical context of primitive religions, Hinduism, Buddhism, Taoism, Confucianism, and Shinto.

60 **Religions of the West and Near East** (3)

History of religion in the ancient world (e.g., Greece) and of Judaism, Christianity, and Islam, including modern developments.

127 **Medicine, Religion, and Healing** (1) (Campus Course)

Total care concept. Importance of religion in medical practice for patient and physician. Concept of the professional, the clergy's role in healing, religious perspective on issues in medical ethics.

216 **Supervised Clinical Pastoral Education** (I-A) (6)

Full-time program of clinical pastoral education in an approved center. Involvement in the responsibility for pastoral ministry is reviewed and evaluated in a peer-group context.

217 **Supervised Clinical Pastoral Education** (I-B) (6)

A continuation of Rel 216 with emphasis on pastoral and personal identity, sustained pastoral relationships, and pastoral methods and skills.

218 **Supervised Clinical Pastoral Education** (III-A) (6)

Responsibility in pastoral ministry is increased with emphasis on group work, interprofessional involvement, use of specific counseling methods, work with persons with special problems. Prerequisite: Rel 216 and 217; or equivalent.

219 **Supervised Clinical Pastoral Education** (III-B) (6)

Continuation of Rel 218 with emphasis on examination and review of administrative procedures, design of pastoral programs, and development of pastoral theology.

222 **Seminar: Christian Ethics** (3) (Campus Course)

Important tendencies in ethical reflection of the contemporary Christian Church; contributions of social sciences to that reflection.

223 **Religious and Ethical Perspectives on Medical Problems** (3)

Religious and ethical questions in medical problems and medically related issues.

235 **Seminar: Roman Catholicism in the Modern World** (3) (Campus Course)

Important leaders and their ideas in selected developments since 1500—doctrinal, spiritual, biblical, liturgical, and ecumenical.

237 **Seminar: Theological Analysis** (3) (Campus Course)

Historical and topical study of the development of important ideas in such areas as Christology, soteriology, and ecclesiology.

299–300 **Thesis Research** (3–3) (Campus Course)

Slavic Languages and Literatures

Chairman: G.A. Olkhovsky, Associate Professor of Russian; Library 627, Telephone 676-6335

Placement Examination: A student who has not been granted advanced standing and who wishes to continue in college the language begun in high school must take a placement examination before registration. Upon completion of the examination, assignment is made to the appropriate course.

1–2 **First-year Russian** (3–3) (Campus Course)

Beginners' course in fundamentals of grammar and pronunciation. Slav 1 is prerequisite to Slav 2. Laboratory fee, $17.50 per semester.

3–4 **Second-year Russian** (3–3) (Campus Course)

Intermediate course in Russian language. Prerequisite to Slav 3: Slav 1–2 or two years of high school Russian. Prerequisite to Slav 4: Slav 3. Laboratory fee, $17.50 per semester.

9–10 **Intermediate Russian Conversation and Composition** (3–3) (Campus Course)

Listening comprehension; oral and written practice. Prerequisite: Slav 4 or 6, or permission of instructor.

91–92 **Introduction to Russian Literature** (3–3)

Emergence and development of Russian literature and ideas during the 19th and early 20th centuries—in English.

109–10 **Advanced Russian Conversation and Composition** (3–3)

Developing proficiency in oral and written expression. Prerequisite: Slav 10 or equivalent.

161–62 **Russian Culture** (3–3)

Survey of Russian cultural heritage from origins of ancient Russia to present—in English. Lectures, discussion, reports.

165 **Soviet Literature from the Revolution to World War II** (3)

Basic themes, trends and literary figures of the 1920s and 1930s. The impact of the revolution and civil war on writers and literature. Lectures, discussions, reports—in English.

166 **Soviet Literature from World War II to the Present** (3)

Literature in wartime and in postwar years. The "thaws," new generation of writers, and new trends in literature of the 1960s and 1970s. Lectures, discussions, reports—in English.

178 **Women in Russian Literature** (3)

The unique role of women in Russian literature. Reading and discussion of major works by Russian women writers—in English.

ociology

hairman: P.L. Stewart, Associate Professor of Sociology; D-201B, Telephone 676-345

Departmental prerequisite: Soc 1 is prerequisite to all courses in Sociology cept for Soc 191.

1 **Introductory Sociology** (3)

General principles of sociology; development of culture and personality, impact of groups and institutions on man's social behavior.

2 **Major Social Issues** (1, 2, or 3)

Critical examination of three selected social issues in a modular format. Each issue will be offered in a module of about 4½ weeks. Students may register for one, two, or three modules, for a corresponding number of credits. Issues change each semester

101 **Development of Social Thought** (3)

An exploration of the emergence and growth of sociology from 1800 to 1930, with emphasis on the elaboration of sociological concepts and theories.

124 **Medical Sociology** (3)

Social factors and processes related to the etiology and treatment of physical and mental illness; medical occupations and professions, medical organizations, problems of delivery of health care services.

126 **Urban Sociology** (3)

The sociological dynamics of the city and of urban growth in the United States; urban conflict, class conflict, and racism; problems of urban decay, crime and deviance, political competition and revolt.

127 **Population Problems** (3)

Composition of populations, trends in population growth and population pressure, factors producing population movements, effects of migration, population policies—eugenics and birth control.

129 Race and Minority Groups (3)

Analysis of relationships between dominant and minority groups in society, particularly in the United States; nature and range of problems; analysis of the phenomenon of prejudice.

130 Class, Status, and Power (3)

Analysis of distribution of resources and opportunities for participation, education, and social mobility in American society; international comparisons; analysis of public policies which affect these distributions.

135 Youth and Delinquency (3)

Analysis of historical, economic, and social conditions affecting both difficulties in socializing youth and the evolution of the state's formal systems of control.

136 Criminology (3)

Nature and distribution of crime as related to the development and operation of criminal law and various social and legal institutions in urban society.

137 Sociology of Law (3)

Law as a social phenomenon and agency of social control. Special emphasis is placed on study of the sources of and challenges to the legitimacy of law.

139 Deviance and Control (3)

(Formerly Society and the Deviant)

Analysis of the development of primary deviance through processes of socialization, analysis of the creation of secondary deviance through collective definitions and responses, within varying historical, political, and social contexts.

140–41 Social Research Methods (3–3)

Soc 140: introduction to basic research methods in sociology. Soc 141: advanced research methods. Prerequisite to Soc 141: Soc 140.

143 Social Movements (3)

General survey of the various forms of collective behavior (fads, panics, riots, social movements, etc.), and a more detailed study of the genesis, development, and decay of social movements and social revolutions.

149 Modern Sociological Theory (3)

Systematic study of contemporary schools of sociological theory, both European and American; evaluation of scientific contributions of each school. Prerequisite: Soc 101.

***153 Poverty in America** (3)

Exploration of social and economic causes of poverty in the United States and evaluation of anti-poverty strategies, including comprehensive welfare reform. Discussion of conflicts between sociological and economic models of behavior of low income groups.

155 Women, Sex Roles, and Socialization (3)

Analysis of the social-structural and personality theories and empirical research on sex role socialization in contemporary society. Topics in-

* Interdepartmental course offered by the Departments of Sociology and Economics.

clude sexual inequality, women's changing place in the occupational structure, and social change and the women's movement .

160 **Death and Dying: A Sociological Perspective** (3)

Processes of death and dying examined from cross-cultural and national perspectives. Topics include considerations of terminal care, abortion, murder, funeral customs, genocide, and the depiction of death in literature and philosophy.

181 **Major Social Processes** (3)

Analysis and examination of various processes in society of general importance to the field of sociology, e.g., social conflict, socialization, social change, etc. Topic changes each semester; may be repeated for credit. Admission by permission of instructor.

191 **Current Emphases in Sociology** (3)

Analysis and evaluation of recent developments in the general field of sociology. Topic changes each semester; may be repeated for credit. Admission by permission of instructor.

201 **Concepts of Sociology** (3)

Systematic survey, critical analysis of sociological concepts. Emphasis on theoretical systems. Topic changes each semester; may be repeated for credit. Admission by permission of instructor.

202 **Uses of Sociology** (3)

Examination of empirical research based upon theoretical perspectives introduced in Soc 201. An introduction to social research methods.

203 **Social Organization** (3)

Introduction to sociological concepts and perspectives on society as a system of institutions. Recommended for students offering sociology as a supporting field.

210 **Theoretical Foundations of Political Sociology** (3)

Sociological theory on the relationship of politics to the wider social system. Emphasis on concepts of power, alienation, ideology, political stability, conflict, and change.

211 **Seminar: Social Change** (3)

Comparative study of political processes concentrating on political development in Third World Nations.

228 **Introduction to Urban Social Problems** (3)

Analysis of urban social theories and paradigms used in urban analysis; historical development of urban centers, including growth, development and change in society's perceptions of problems; examinations of legislative changes and policy making as they apply to urban areas.

229 **Analysis of Urban Social Problems** (3)

Examination of specific urban social problems. Effects of density on populations, demographic changes in population, poverty in relation to urban problems, child abuse and family problems, prognosis for future of urban areas.

240 **Sociology of Work and Occupations** (3)

Analysis of occupational roles and structures; recruitment and training; adjustment problems at various career stages; interrelationships of stratification, life styles, and work roles.

241 **Sociology of Work and Organizations** (3)

Theory of complex organizations relative to work in industry, government, and business; examination of basic processes such as decision-making, recruitment, allocation of authority, informal organization, and interorganizational relations.

248 **Seminar: Organizational Theory and Behavior** (3)

Advanced analysis of theory and behavior in complex organizations relative to defining organizations, examining basic social processes and their relationship to the cultural environment.

252 **Seminar: Sociology and Social Policy** (3)

Concepts, theory and research which demonstrate the applicability of a sociological perspective (for example, views on social systems, roles, formal organization, power, stratification, decision-making, social values) to the policy process.

*254 **Seminar: Methods in Social Policy Research** (3)

Systematic survey of conceptualization, design and practice of evaluation research of social experiments, and of simulation and technological forecasting. Prerequisite: Stat 105, Soc 230, 252; or permission of instructor.

†259 **Law and Criminology I: Search for the Causes of Criminal Behavior** (3)
Same as Law 475(2)

†261 **Law and Criminology II: Society's Responses to the Criminal Offender** (3)
Same as Law 476(2)

262 **Seminar: Police and the Community** (3)

Analysis of contemporary urban law enforcement, including policing "styles," civil disorder, police-community relations, and competing perspectives on the place of police agencies in civil society.

263 **Seminar: Law and Society** (3)

Selected problems in law as an instrument of social policy; emphasis on the organization of legal decision-making processes.

270 **Educational Sociology** (3)

Analysis of educational systems from institutional perspectives and as agencies of socialization; relationships of education in general to society, including technological, communal, and subcultural components.

---

* Offered jointly by the Educational Policy and Sociology departments.

† Students registering for Soc 259 or 261 make special arrangements with the instructor for supplementary assignments equivalent to one additional semester hour. For description of the courses, see the *National Law Center Bulletin*.

271 Sociology of the Youthful Offender (3)

Factors producing delinquency, juvenile detention, the juvenile court, training schools, treatment of offenders.

273 Deviant Behavior (3)

Analysis of relationships of society, socialization, and deviancy. Social responses to deviancy and criminal offenders; rehabilitative programs in community, courts, and schools.

274 Human Sexuality (3)

A synthesis of theoretical perspectives from which analysis of various forms of sexual behavior and problems related to sexuality will be undertaken.

295 Research (arr.)

Independent study and special projects. Before permission is granted to register for Soc 295, the student must submit a written plan of study for the approval of the staff member of the department who will be directing the research. May be repeated once for credit.

351 Selected Topics in Sociology (3)

Intensive investigation of special topics in sociology. May be repeated for credit. The following topics will be offered as the demand requires each fall semester: (1) *Social Research*—causal inference in social research, evaluation research, philosophy of science, etc.; (2) *Political Sociology*—comparative political structures, processes of policy formation, social movements, etc.; (3) *Sociology of Work*—work and public bureaucracies, industrial sociology, etc.

Spanish*

Chairman: G.E. Mazzeo, Professor of Romance Languages; Monroe 411, Telephone 276-6330

Placement Examination: A student who has not been granted advanced standing and who wishes to continue in college the language begun in high school must take a placement examination before registration. Upon completion of the examination, assignment is made to the appropriate course.

1–2 First-year Spanish (3–3) (Campus Course)

A year course; credit toward a degree at this University given on completion of Span 2. For beginners. Pronunciation, conversation, grammar, composition, readings. Oral practice in language laboratory. Laboratory fee, $17.50 per semester.

3–4 Second-year Spanish (3–3) (Campus Course)

A year course; credit toward a degree at this University given on completion of Span 4. Conversation, grammar review, composition, reading of modern Spanish prose. Oral practice in language laboratory. Prerequisite: Span 1–2. Laboratory fee, $17.50 per semester.

*Administered by the Department of Romance Languages and Literatures.

Special Education

Acting Chairman: R.K. Ives, Professor of Special Education; C-524, Telephone 676-6170

200 **Psychosocial Development of Young Exceptional Children** (3)

A course designed to illuminate the complex and interactive processes which exist in the relationship between psychosocial development and the development process in general.

201 **Introduction to Special Education** (3)

Survey course to acquaint prospective teachers with special education and to help them become aware of the various educational modifications necessary to accommodate children in a school program.

230 **Vocational/Special Education Assessment of the Secondary Level Handicapped Student** (6)

Individual study of methods and materials used in vocational assessment including formal and informal tests to determine vocational interests and aptitudes, academic performance, learning style and behavioral readiness.

231 **Selected Vocational/Special Education Methods and Materials** (3)

Selected materials and techniques used in teaching and programming for the secondary school level handicapped person in academic, career, leisure, and occupational skill areas.

232 **Practicum: Vocational/Special Education** (3)

Placement in at least three to five different sites offering programs in the areas of pre-vocational, industrial arts, and vocational programming that serve the adolescent student.

233 **Curriculum for Vocational/Special Education** (3)

Examples and practice in designing and implementing academic, self-help, career education, pre-vocational, industrial arts, and vocational curriculum skills for the handicapped.

234 **Seminar in Vocational/Special Education** (3)

Weekly seminar dealing with experiences, problems, and concerns encountered during the internship with handicapped adolescents. Must be taken concurrently with SpEd 295.

235 **Coordination of Job Placement Programs in Vocational/Special Education (3)**

Examples and programming considerations for the development and coordination of an adolescent job placement program.

236 **Secondary Career Planning for the Handicapped** (3)

This course will address the on-going process of career decision making by the handicapped person who is completing a secondary school level program.

260 **Developmental Assessment of Young Exceptional Children** (3)

Lectures, demonstrations, and clinical practice in formal and informal assessment procedures. Admission by permission of instructor.

261 **Practicum: Methods and Materials for Young Exceptional Children** (6)

Clinical practice in design and implementation of educational strategies and materials. Three dimensions: designing and developing teaching materials, classroom teaching, feedback and evaluation with professor. Taught at a demonstration site. Requires ten hours a week in service.

262 **Seminar: the Education of Young Exceptional Children** (3)

Weekly seminar dealing with experiences, problems, and concerns encountered during the internship for the education of young exceptional children. Must be taken concurrently with SpEd 292. Admission by permission of instructor.

263 **The Severely and Profoundly Handicapped Child: Development and Etiology** (3)

Survey of the characteristics and learning patterns of children with severe disabilities. Lecture and field experience.

264 **The Severely and Profoundly Handicapped Child: Methods and Techniques** (3)

Specialized programs, techniques, and methods for teaching children with severe disabilities.

266 **The Development of Language in Young Exceptional Children** (3)

Introduction to the study of language acquisition and the application of current research on language of handicapped children.

267 **The Early Childhood Special Educator: A Survey of Roles and Services** (3)

Examination of the spectrum of roles available in early childhood special education; emphasis on role expectations and psychosocial dynamics of the various settings.

268 **The Development of Young Exceptional Children with Emphasis on Handicapping Conditions** (3)

An in-depth examination of young exceptional children and the specific nature of handicapping conditions. Lecture and field visitation required.

269 **Multidisciplinary Theory in Special Education** (3)

Seminar involving student presentations focusing on sociological and psychological constructs relevant to interpersonal/intrapersonal relationships.

270 **Mainstreaming: Adapting Programs and Curriculum to Meet the Needs of the Special Child** (3)

Review of the basic curriculum areas as they relate to the development of readiness skills in special education.

271 **The Interdisciplinary Approach to Planning for the Handicapped Child** (3)

Laboratory experience in which students participate as educational members of an interdisciplinary team.

273 **Seminar for Special Education Strategist Intern** (3 or 6)

Weekly seminar dealing with experiences, problems, and concerns encountered during special education early childhood strategist internship. Concurrent enrollment in SpEd 293 required.

290 **Control and Management Techniques for the Young Exceptional Child** (3)

Examination of the theory, techniques, and tools essential for group control. Designed to provide practice as well as familiarity with the various theories of control of human behavior. Admission by permission of instructor.

292 **Professional Internship in Education of Young Exceptional Children** (6 or 9)

Supervised internship in the education of young exceptional children. A minimum of 420 clock hours required. Must be taken concurrently with SpEd 262.

293 **Professional Internship for the Special Education/Early Childhood Strategist** (9)

Supervised internship in strategist role, emphasizing diversified, multi-dimensional aspects of a special education early childhood program. A minimum of 420 clock hours is required. Concurrent enrollment in SpEd 273 required.

295 **Professional Internship in Vocational/Special Education** (9)

Supervised internship in the vocational/special education of adolescent handicapped youth, emphasizing the diversified, multi-dimensional, and inter-agency cooperative needs for such programming. A minimum of 420 clock hours is required. Must be taken concurrently with SpEd 234.

303 **Administration and Supervision of Special Education** (3)

Philosophy and nature of special education; litigation, program organization, administration, and development. Surveying local-level needs; program evaluation and supervision. Admission by permission of instructor.

306 **Dynamics of Family Intervention: Theory and Practice in Special Education** (3)

Theoretical foundations and clinical techniques necessary for the early childhood special educator to successfully counsel parents of handicapped children.

360 **Advanced Techniques in the Diagnostic-Assessment Process** (3)

Application of theoretical concepts of assessment; development of assessment programs; interpretation and application of interdisciplinary diagnostic evaluations. Prerequisite: SpEd 260 or equivalent.

Speech and Drama

Chairman: L.S. Bowling, Professor of Speech and Hearing, Auditorium B10, Telephone 676-6350

1 **Communicative Speaking and Listening** (3)

Basic theories and principles of public speaking: research, composition, delivery, and criticism. Recording fee, $5.

11 Voice and Diction (3)

Development of naturalness, correctness, and clarity in conversation through the study of phonetics, rate, volume, pitch, and quality in preparation for performance. Recording fee, $5.

32 Interpretation (3)

(Formerly Interpretation of Literature)

The study of literature through performance. Interpretation of prose, poetry, and drama.

45 Understanding the Theater (3)

The art of the theater: its literature, aesthetics, and mechanics. Contributions of the playwright, actor, director, and designer examined through lectures and class discussion. Attendance at theatrical performances and presentations by visiting artists. Primarily for nonmajors.

111 Business and Professional Speaking (3)

Study of the communication process in business and professional speaking; practice in presenting technical reports; selling policies, programs, and services; interviews; conferences; speech in training and supervisory activities. Primarily for nonmajors. Through the College of General Studies this course can be adapted to the needs of a specific group.

121 Group Discussion and Conference Leadership (1 or 2)

(Formerly 3 credits)

Process of thinking and problem-solving in committees and small groups; methods of leading discussions and conferences. Prerequisite: SpDr 1 or permission of instructor.

Statistics

Chairman: S.W. Greenhouse, Professor of Statistics; C-315, Telephone 676-6356

Departmental prerequisite: One entrance unit in algebra is prerequisite to all undergroup courses in statistics.

***†51 Introduction to Business and Economic Statistics** (3)

(Campus Course)

Lecture (3 hours), laboratory (1 hour). Frequency distributions, descriptive measures, probability, sampling, estimation, tests of hypotheses, regression and correlation, time series, index numbers. Laboratory fee, $18.

†53 Introduction to Statistics in Social Science (3)

Lecture (3 hours), laboratory (1 hour). Frequency distributions, descriptive measures, probability, sampling, estimation, test of hypotheses, regression and correlation. Laboratory fee, $18

97 Introduction to Computer Programming (3)

Lecture (2 hours), laboratory (2 hours). Computer and programming concepts. High-level language programs written by students will be run on the University computer. Laboratory fee, $25.

*Stat 101, which is offered off campus, may be substituted.

†Stat 51, 53, 101, 111, and 127 are related in their subject matter, and credit hours for only one course may be applied toward a degree.

*101–2 **Basic Principles of Statistical Methods** (3–3)

Variables and attributes, averages and dispersion, elementary principles of sampling, introduction to the making of statistical decisions. Prerequisite to Stat 102: Stat 101.

105 **Statistics in the Behavioral Sciences** (3) (Campus Course)

Lecture (3 hours), laboratory (1 hour). Advanced study of statistical techniques for research problems. Analysis of variance, correlation techniques, nonparametric techniques, sampling theory. Prerequisite: Stat 53 or equivalent, and satisfactory performance on a placement examination. Laboratory fee, $18.

*111 **Business and Economic Statistics I** (3) (Campus Course)

Statistical methods appropriate for applications in economics and business.

112 **Business and Economic Statistics II** (3) (Campus Course)

Continuation of Stat 111 with emphasis on techniques of regression, Chi-square, sampling designs, index numbers, and other topics used in economics and business. Prerequisite: Stat 111 or equivalent.

*127 **Statistics for the Biological Sciences** (3)

Introduction to statistical techniques and reasoning applicable to the biomedical and related sciences. Properties of basic probability functions: binomial, Poisson, and normal. Data analysis, inference, and experimental design.

211 **Introduction to Economic Statistics** (3)

A survey of statistical techniques for application to problems in economic analysis. (For special studies students only.)

Telecommunication Operations

Faculty Advisor. D.A. Rowley, Associate Professor of Chemistry; Bacon 201, Telephone 676-6210

240 **Seminar in Telecommunication Policy and Regulations** (3)

International and domestic telecommunications institutions; the policy and regulatory process; spectrum management; cable telecommunications systems; common carrier microwave transmissions system; mobile system; broadcasting-AM, FM, UHF, VHF-TV; satellites; United States domestic satellites; mobile satellite system; international telecommunications law; environmental impact; United States government systems; INTELSAT.

* Stat 51, 53, 101, 111, and 127 are related in their subject matter, and credit hours for only one of the five may be applied toward a degree.

INDEX

Abbreviations for courses, 84-85
Absence, regulations concerning, *see* Attendance
Academic dishonesty, 35
Academic status:
  Of the College of General Studies, 14
  Of the Univeristy, 8-9
Accelerated degree completion program, 55
Accounting courses, 85
Accreditation, 8-9, 14
Acoustics, M.S. field, 60-63
Administration, officers of, 12-13
Admission, 16-22
Advanced standing and placement, 17-19, 53-54
Aeronautics, M.S. field, 60-63
Alpha Sigma Lambda, 36
Alumni association, 10
American civilization courses, 85
American College Testing Program, *see* Examinations
Anthropology courses, 86
Application:
  For admission and degree candidacy, 16-22
  For graduation, 33
Applied science courses, 86-87
Art courses, 87-88
Associate's degrees, 47, 51
Astronomy courses, 136
Attendance, 29, 34
Auditing, 23, 27
Bachelor's degrees, 48-49, 51-52
Balance sheet, 32
Biological sciences courses, 88
Board of Trustees, 10-11
Bookstore, 37
Business administration courses, 88-89
Calendar for 1979-80, 4-5
Campus study, 29, 46, 56, 61, 67
Career certificate programs, 42-44
Career services office, student and alumni, 38
Cartographic science, A.S. and B.S. in, 46, 49-52
Cartography courses, 89-91
Changes in program of studies, 31-32, 36
Chemistry courses, 91
Chinese courses, 92
Civil engineering courses, 92-94
College Entrance Examination Board tests and College-Level Examination Program, *see* Examinations
Colleges, schools, and divisions of the University, 7-8
Columbian College of Arts and Sciences, 17, 44-55
Comprehensive examination, Master's, *see* Examinations
Computer science courses, 111-12
Concurrent registration, 23
Conduct, 35
Consortium of Universities of the Washington Metropolitan Area, Inc., 23
Continuing Education for Women Center, 41-44
Continuous enrollment, 32
Correspondence courses, 19, 54
Counseling, 37, 41
Course numbers, explanation of, 83
Courses of instruction, 83-154
Credit, 32, 84
Criminal Justice concentration, M.A. in Sp.Std., 58
Dean's list, 34
Degree candidacy, admission to, 16-22
Degree programs, 15, 44-69
Dishonesty, academic, 35
Dismissal of students, 36
Dissertation, 33-34, 65
Distinction, degrees earned with, 34
Doctor of Science degree, 22, 64-66
Dropping courses, 31
Economics courses, 100-101
Education courses, 101-9
Education directors of area instruction, 80–81
Education Specialist, 21, 68-69
Electrical engineering
  Courses, 109-11
  M.S. field, 60-63
Elementary education, M.A. in Ed. field, 66-69
Employment, student, 44-45
Engineering administration
  Courses, 113-16
  Master's program, 63
Engineering science courses, 94-98
English courses, 116-18
Environmental health courses, 118-19
Environmental modeling, M.S. field, 60-63

Environmental science concentration, M.S. in Sp.Std., 59
Equal opportunity, university policy on, 9
Examinations:
  American College Testing Program, 17
  College Entrance Examination Board, 17:
    Advanced placement tests, 18
    Achievement tests, 18
    College-Level Examination Program, (CLEP) 18, 53-54
  Columbian College special departmental, 18, 25, 54
  Doctor of Science, final and qualifying, 65
  Master's comprehensive, 57, 63, 68, 69
  Waiver, 19, 25, 53-54
Fees and financial regulations, 23-28
Flight sciences, M.S. field, 60-63
Fluid mechanics and thermal sciences, M.S. field, 60-63
Forensic science courses, 119-21
French courses, 121
Fund raising administrator program, 43
General alumni association, 10
Geodesy courses, 122-23
Geodesy, A.S. and B.S. in, 49-52
Geography and regional science courses, 123-24
Geology courses, 124-25
Germanic languages and literatures courses, 125-26
Grades, 29-31
Graduate degree candidacy, admission to, 19-22
Graduate degrees, 55-69
Graduation:
  Application for, 33
  Fee, 25
  Requirements, 33-34
Handicapped students, *see* Students with disabilities, services for
Hebrew courses, 126
Higher education, M.A. in Ed. field, 66-68
History courses, 126-27
History of the University, 6-7
Honor societies, 36-37
Honorary Trustees, 11
Honors, 34
Human kinetics and leisure studies courses, 127-29
Human resource development, M.A. in Ed. field, 66-68
Inactive status, 33
Incomplete:
  Assignment of the grade of, 30
  Removal of, 45, 57, 62, 67
Italian courses, 129
Journalism courses, 130
Landscape architect assistant program, 43
Language requirement, D.Sc. degree, 65
Law enforcement education program, 28
Leave of absence, 32-33, 57
Legal assistant program, 42
Legislative affairs concentration, M.A. in Sp.Std., 58
Library, 35
Management science courses, 130
Managerial development program, 43
Master's comprehensive examination, 57, 63, 68
Master's degrees, 55-63, 66-69
Mathematics courses, 131-32
Mechanical engineering courses, 98-100
Military transfer of students, 53-55
Music courses, 132-33
Noncredit courses, 42
Nondegree special programs, 15-16
Nondegree student, admission, 16
Oceanography:
  B.S. in, 49-52
  Courses, 133-35
Off-campus locations of the College of General Studies, 71-82
Officers of Administration, 12-13
Oral biology concentration, M.S. in Sp.Std., 59
Oral biology courses, 135
Payment of fees, 23-25
Pharmacology courses, 135
Phi Beta Kappa, 37
Philosophy courses, 136
Physical science courses, 91
Physics courses, 136
Political science courses, 137-40
Probation, 45
Programs, right to make changes in, 36
Psychology courses, 141-42
Publication specialist program, 42
Quality-point index, 30-31
Readmission, 22
Refund of fees, 27-28
Registration, 23
Regulations, 29-36
  Financial, 23-28
Release of student information, policy on, 36
Religion and medical care, M.A. field, 55-56
Religion courses, 143-44

sidence, 33
Requirements, *see* degree concerned
ties of the University, right to change, 36
ssian courses, 144-45
holarship requirements, 29-31; *see also* degree concerned
condary education, M.A. in Ed. field, 66-68
mester hours, explanation of, 84
rvice schools, credit through, 19, 53
rvicemen's Opportunity College (SOC), 53-55
avic languages and literatures courses, 144-45
cial and economic statistics concentration, M.S. in Sp.Std., 59-60
cial and organizational behavior concentration, M.A. in Sp.Std., 58
ciology courses, 145-49
id mechanics and materials science, M.S. field, 60-63
anish courses, 149
ecial education:
Courses, 150-53
M.A. in Ed. field, 66-68
cial honors, 34
eech and drama courses, 152-53
atistics courses, 153-54
dent and alumni career services office, 38
dent information, release of, 36
Student services, 36-38
Students with disabilities, services for, 9
Supervision and human relations, M.A. in Ed. field, 66-68
Supervisory specialist program, 43
Suspension, 46
Telecommunication operations:
M.S. in Sp.Std. concentration, 60
Courses, 154
Thesis, 24, 25, 34; *see also* degree concerned
Tool requirement, D.Sc. degree, 65
Transcripts of record, 25, 32
Transfer:
From other institutions, 17-18; *see also* degree concerned
Within the University, 32, 46
Trustees, Board of, 10-11
Tuition, 23-24
Projected increases, 25-26
Undergraduate degree candidacy, admission to, 16-19
Undergraduate degrees, 44-52
University bookstore, 37
University center fee, 24
Urban learning concentration, M.A. in Sp.Std., 58
Veterans benefits, 37-38
Waiver examinations, 19
Warnings, 31
Withdrawal, 27-28, 30, 31

COLLEGES AND SCHOOLS—DEGREE PROGRAMS

COLUMBIAN COLLEGE OF ARTS AND SCIENCES: Associate in Arts (A.A.), Associate in Arts in General Studies (A.A. in Gen.Std.), Associate in Science in Cartographic Science (A.S. in Cart.Sc.), Associate in Science in Geodesy (A.S. in Geod.), Bachelor of Arts (B.A.), Bachelor of General Studies (B.Gen.Std.), Bachelor of Science (B.S.), Bachelor of Science in Cartographic Science (B.S. in Cart.Sc.), Bachelor of Science in Geodesy (B.S. in Geod.), and Bachelor of Science in Oceanography (B.S. in Ocea.)

GRADUATE SCHOOL OF ARTS AND SCIENCES: Master of Arts (M.A.), Master of Arts in Special Studies (M.A. in Sp.Std.), Master of Fine Arts (M.F.A.), Master of Forensic Sciences (M.F.S.), Master of Music (Mus.M.), Master of Science (M.S.), Master of Science for Teachers (M.S. for Teachers), Master of Science in Forensic Science (M.S.F.S.), Master of Science in Special Studies (M.S. in Sp.Std.), and Doctor of Philosophy (Ph.D.)

SCHOOL OF MEDICINE AND HEALTH SCIENCES: Associate in Science (A.S.), Bachelor of Science (B.S.), Bachelor of Science in Health Science (B.S. in H.Sc.), and Doctor of Medicine (M.D.)

NATIONAL LAW CENTER: Juris Doctor (J.D.), Master of Laws (LL.M.), Master of Comparative Law (M.Comp.L.), Master of Comparative Law (American Practice) (M.Comp.L. [Am.Prac.]), and Doctor of Juridical Science (S.J.D.)

SCHOOL OF ENGINEERING AND APPLIED SCIENCE: Bachelor of Science (Civil Engineering) (B.S. [C.E.]), Bachelor of Science (Electrical Engineering) (B.S. [E.E.]), Bachelor of Science (Mechanical Engineering) (B.S. [M.E.]), Master of Engineering Administration (M.E.A.), Master of Science (M.S.), Engineer (Engr.), Applied Scientist (App.Sc.), and Doctor of Science (D.Sc.)

SCHOOL OF EDUCATION AND HUMAN DEVELOPMENT: Bachelor of Arts in Education (B.A. in Ed.), Bachelor of Science in Human Kinetics and Leisure Studies (B.S. in H.K.L.S.), Master of Arts in Education (M.A. in Ed.), Master of Arts in Teaching (M.A.T.), Education Specialist (Ed.S.), and Doctor of Education (Ed.D.)

SCHOOL OF GOVERNMENT AND BUSINESS ADMINISTRATION: Bachelor of Business Administration (B.B.A), Bachelor of Science in Administration (B.S. in Adm.), Bachelor of Science in Health Care Administration (B.S. in H.C.A.), Master of Accounting (M.Acct.), Master of Arts in Health Care Administration (M.A. in H.C.A.), Master of Business Administration (M.B.A.), Master of Public Administration (M.P.A.), Master of Urban and Regional Planning (M. of Urb. and Reg.Plan.), Post-Master's Graduate Certificate in Health Care Administration (Grad.Cert. in H.C.A.), Doctor of Business Administration (D.B.A.), and Doctor of Public Administration (D.P.A.)

SCHOOL OF PUBLIC AND INTERNATIONAL AFFAIRS: Bachelor of Arts (B.A.), Master of Arts (M.A.), and Master of Science in International Affairs (M.S.I.A.)

ANNUAL ISSUES OF UNIVERSITY BULLETINS

Requests for the following publications must include your zip code and should be addressed to the office indicated, George Washington University, Washington, D.C. 20052.

COLLEGE OF GENERAL STUDIES, Dean of the College

NATIONAL LAW CENTER, Admissions Office, National Law Center

SCHOOL OF ENGINEERING AND APPLIED SCIENCE, Dean of the School

UNDERGRADUATE AND GRADUATE PROGRAMS (Arts and Sciences, Education and Human Development, Government and Business Administration, Public and International Affairs), Admissions Office

SCHOOL OF MEDICINE AND HEALTH SCIENCES, Admissions Office, School of Medicine and Health Sciences

SCHEDULE OF CLASSES: FALL (Preregistration Edition, Revised Edition) and SPRING SEMESTERS, Registrar

SCHEDULE OF CLASSES: SUMMER SESSIONS, Dean of the Summer Sessions

GEORGE WASHINGTON UNIVERSITY

COLUMBIAN COLLEGE OF ARTS AND SCIENCES, 1821

THE GRADUATE SCHOOL OF ARTS AND SCIENCES, 1893

THE SCHOOL OF MEDICINE AND HEALTH SCIENCES, 1825

THE NATIONAL LAW CENTER, 1865

THE SCHOOL OF ENGINEERING AND APPLIED SCIENCE, 1884

THE SCHOOL OF EDUCATION AND HUMAN DEVELOPMENT, 1907

THE SCHOOL OF GOVERNMENT AND BUSINESS ADMINISTRATION, 1928

THE SCHOOL OF PUBLIC AND INTERNATIONAL AFFAIRS, 1928

THE DIVISION OF UNIVERSITY STUDENTS, 1930

THE COLLEGE OF GENERAL STUDIES, 1950

THE SUMMER SESSIONS, 1916

THE UNIVERSITY HOSPITAL, 1898

THE DIVISION OF EXPERIMENTAL PROGRAMS, 1973

7/79—Cornelius—14M



HE GEORGE WASHINGTON UNIVERSITY CAMPUS / WASHINGTON, D.C.